**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Application of Pacific Gas And Electric Company for Authority to Increase Revenue Requirements to Recover the Costs to Upgrade Its SmartMeter^{TM} Program (U39E)	Application No. 07-12-009 (Filed December 12, 2007)

**COMPLIANCE FILING OF
PACIFIC GAS AND ELECTRIC COMPANY (U 39 E)
PURSUANT TO DECISION 09-03-026**

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Dated: April 30, 2014

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Pursuant to Ordering Paragraph 10 of Decision (D.) 09-03-026, Pacific Gas and Electric Company (PG&E) hereby files its 2013 Program Year SmartMeter™ Program Enabled Demand Response and Energy Conservation Annual Report. As directed by the Commission in D.09-03-026, PG&E—in direct consultation with Energy Division—files within this docket its report on the energy savings and associated financial benefits of all demand response, load control, and conservation programs enabled by PG&E's SmartMeter™. The Report is due in April of each year until 2019. PG&E's Report is attached hereto as Appendix A.

Respectfully Submitted,

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By: *\/s/ Shirley A. Woo*
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ATTACHMENTS

PG&E 2013 PROGRAM YEAR SMARTMETER™ PROGRAM ENABLED DEMAND RESPONSE AND ENERGY CONSERVATION ANNUAL REPORT

AND

PACIFIC GAS & ELECTRIC COMPANY'S SMARTMETER™ ENABLED PROGRAMS: PROGRAM YEAR 2013 EVALUATION OF CUSTOMER WEB PRESENTMENT AND ENERGY ALERTS

PG&E 2013 Program Year SmartMeter™ Program Enabled Demand Response and Energy Conservation Annual Report

Prepared for:
Pacific Gas & Electric Company

Presented on:
April 30, 2014

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ABSTRACT

Pursuant to Ordering Paragraph 10 of Pacific Gas and Electric Company's (PG&E) SmartMeter Upgrade Decision (D.09-03-026), PG&E has prepared this report to provide a review of PG&E's program year 2013 ex post load impacts, energy conservation and financial benefits for the dynamic pricing, demand response and energy conservation programs and initiatives enabled by PG&E's SmartMeter ™ program. The report provides a description of each program as well as the methodology adopted to estimate the load impacts, energy savings and associated financial benefits.

In 2013, PG&E operated the following SmartMeter enabled programs or initiatives: SmartRate™ and Peak Day Pricing (PDP), which are dynamic pricing programs designed to provide load response to pricing signals; Time of Use (TOU), which is a time varying program; and Customer Web Presentment (CWP), Energy Alerts, and Home and Business Area Network (HAN) which are energy conservation initiatives that are based on customer access to energy usage information. With methodologies evolving and more data becoming available in the future, more definitive findings can be expected in future Demand Response and Energy Conservation Reports under Ordering Paragraph 10 of D.09-03-026.

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INTRODUCTION

This report documents program year 2013 (PY 2013) ex post load impacts, energy conservation, and financial benefits for the PG&E SmartMeter™ enabled dynamic pricing, demand response (DR) and energy conservation programs and initiatives. It has been prepared pursuant to Ordering Paragraph 10 of PG&E's SmartMeter Upgrade Decision (D.09-03-026), which requires PG&E to report to the California Public Utilities Commission (CPUC):

> "...the energy savings and associated financial benefits of all demand response, load control, energy efficiency, and conservation programs enabled by advanced metering infrastructure (AMI), including programmable communicating thermostat (PCT) programs, Peak Time Rebate (PTR) programs, and other dynamic rates for residential customers." [1]

The demand response impacts contained herein are estimated in compliance with the Commission's adopted load impact protocols contained in Decision 08-04-050.[2]

[1] Ordering Paragraph 10, SmartMeter Upgrade Decision (D.0903-026), page 196.
[2] Decision 08-04-050. Decision Adopting Protocols for Estimating Demand Response Load Impacts. April 24, 2008.

PROGRAM OVERVIEW

There were two categories of SmartMeter enabled programs and initiatives in operation during PY 2013. These are described below:

Demand Response and Dynamic Pricing (or Time Varying) Programs: These currently include SmartRate™, which is a Residential Critical Peak Pricing program; Peak Day Pricing (PDP), which is a non-residential Critical Peak Pricing program; and residential and non-residential Time-of-Use (TOU) rates.

Informational Energy Conservation Programs /Initiatives: These currently include Energy Alerts, Customer Web Presentment (CWP) of interval data, and Home and Business Area Network (HAN).

PG&E is awaiting Commission action on an additional PG&E SmartMeter™ enabled demand response program, Peak-Time Rebate (PTR). Currently there is no PG&E proposal pending on two other types of program, Real Time Pricing (RTP) and Programmable Communicating Thermostats (PCT).

2.1 SMARTMETER ENABLED DEMAND RESPONSE AND DYNAMIC PRICING PROGRAMS

2.1.1 SmartRate – Residential Critical Peak Pricing (CPP)

The SmartRate pricing structure is an overlay on top of PG&E's residential rate schedules. SmartRate pricing consists of an incremental charge that applies during the peak period on SmartDays™ and a per kilowatt-hour credit that applies for all other hours from June through September. For residential customers, the additional peak-period charge on SmartDays is 60¢/kWh, and applies between 2:00 pm and 7:00 pm. The credit has two components for residential customers. The first is a 3¢/kWh credit that applies to non-peak period usage between June and September; the second is an additional 1¢/kWh credit that applies to usage in Tiers 3, 4, and 5 between June and September. Up to fifteen SmartDays can be called during non-holiday weekdays from May 1 to October 31.

SmartRate customers are also allowed to enroll in PG&E's SmartAC program, which is an air conditioning load control program. For dually enrolled customers, PG&E automatically cycles their air conditioning systems during SmartDay events by controlling their SmartAC devices. Customers can choose to opt-out of the automatic AC cycling, but that requires action on their part. Based on the results of this and previous studies, this option increases load reductions for those customers during the SmartDay peak periods.

PG&E began offering the SmartRate program in May 2008 to residential and small and medium commercial customers with SmartMeters in the Bakersfield and greater Kern County area. Pursuant to CPUC Decision 10-02-032 (Peak Day Pricing Decision), SmartRate's small and medium commercial customers were transitioned to PG&E's non-residential PDP program on May 1, 2010.[3] The details of this transition are discussed in the Non-Residential PDP section that follows.

On January 14, 2011, PG&E filed a Petition for Modification of Decision 10-02-032 (PFM) and proposed a new timetable for transitioning customers to time-varying rates, including both residential and non-residential PDP. PG&E proposed the elimination of the requirement to

[3] CPUC Decision 10-02-032. Decision on Peak Day Pricing for Pacific Gas and Electric Company. February 25, 2010 (Issued March 2, 2010). Page 10.

implement a new residential PDP rate by November 1, 2011 and requested that SmartRate be retained as an option for residential customers until residential dynamic pricing options are considered again by the Commission. PG&E also proposed that the timing of default enrollment of residential customers onto time-varying rates be addressed in the PTR and Default Residential Rate Program applications (A.10-02-028 and A.10-08-008).[4]

On November 10, 2011, the CPUC issued a decision (D. 11-11-008) granting PG&E's PFM, with some exceptions.[5] Importantly, the CPUC granted "PG&E's proposal to eliminate the requirement to implement a new residential PDP rate, and, instead, to retain SmartRate as an option for residential customers until the Commission completes its pending review of default residential dynamic pricing rates in Application 10-08-005."[6] Subsequently the Commission has transferred its review of default residential rates to R.12-06-013, "Order Instituting Rulemaking on the Commission's Own Motion to Conduct a Comprehensive Examination of Investor Owned Electric Utilities' Residential Rate Structures, the Transition to Time Varying and Dynamic Rates, and Other Statutory Obligations."

Enrollment[7] in SmartRate grew substantially during PY 2013. Approximately 79,800 customers were enrolled at the end of 2012 and about 118,000 were enrolled as of the end of 2013. Of those enrolled in late 2013, 79,842 were enrolled in SmartRate only, and 38,302 were dually enrolled in SmartRate and SmartAC.[8] Eight events were called in 2013.

PG&E submitted its load impact analysis for SmartRate™ on April 01, 2014 in R.07-01-041. The title is 2013 Ex Post Load Impact Evaluation of Pacific Gas and Electric Company's Residential Time-based Pricing Programs. It can be accessed using the following link: http://apps.pge.com/regulation/SearchResults.aspx?NewSearch=True&CaseID=1403&DocType=&PartyID=9999&fromDate=04%2F01%2F14&toDate=04%2F01%2F14&sortOrder=FileName&currentPage=1&recordsPerPage=100&searchDocuments=Search

2.1.2 Peak Day Pricing – Non-Residential Critical Peak Pricing (CPP)

PDP[9] is an overlay of critical peak pricing on top of non-residential time-of-use rates. PDP's price signals are designed to encourage customers to reduce peak load during event days, which are typically temperature triggered, but can also be called for high market prices or extreme system conditions. Under the PDP tariff, PG&E targets a minimum of 9 and a maximum of 15 event days per year. On event days, PDP customers face higher charges for energy used between 2 PM to 6 PM. Events can be called seven days a week, all year-round. In return for the higher rates during event days, customers receive either per unit energy credits, capacity credits or both between May 1 and October 31, depending on their associated rate schedule. The adopted event-period price adder for customers varies by rate. For example, the CPP event-period adder is $60/kWh for the A-1 rate, $0.90/kWh for the A-10 rate, and $1.20/kWh for the E-19 and E-20 rates.

Pursuant to the CPUC's February 2010 PDP Decision (D.10-02-032), in May 2010, PG&E began defaulting large commercial and industrial customers (≥200 kW) that have met the eligibility criteria onto PDP.[10] PG&E provides bill protection during the first year on PDP to encourage

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[4] Application 09-02-022. Petition of Pacific Gas and Electric Company for Modification of Decision 10-02-032. January 14, 2011; Pg. 19.
[5] CPUC Decision 11-11-008. Decision Granting in Part and Denying in Part Petitions for Modification of Decision 10-02-032. November 10, 2011.
[6] Ibid, page 3-4.
[7] To be consistent, the enrollment figures for the DR and Dynamic Pricing programs included in this report have been taken from each program's load impact evaluation reports filed on April 1, 2014. These figures reflect the enrollment numbers for the program for PY 2013.
[8] Since SmartAC is not a SmartMeter enabled program, only the impacts for singly enrolled SmartRate participants are reported in Chapter 4.
[9] To be eligible for PDP, customers must have an interval meter with interval data, which does not have to be a SmartMeter. However, this report only includes the load reduction and energy savings of the customers with a SmartMeter.
[10] To be eligible for default as a large customer, bundled customers must have 12 months of valid interval electricity data, three consecutive months of peak demand of at least 200 kW, access to their interval data for at least 45 days and receive electricity service on an applicable tariff and may not be direct access, net-energy metered or participating in specific demand response programs. The default criteria for other customer classes (i.e. small and medium business as well as large agricultural customers with demand > 200kW) can change to reflect the appropriate minimum demand level and transition dates as ordered in D.10-02-032.

customers to try it without risk.[11] The defaulted large customers have the ability to stay enrolled or opting-out by choosing the rate that works best for them. At the same time in May 2010, PG&E was also required to both transition all existing non-residential SmartRate customers to PDP and make the rate available on a voluntary basis to small and medium agricultural, commercial and industrial (C&I) customers with SmartMeter that are interval-billed enabled.

On November 10, 2011, the CPUC issued a decision (D. 11-11-008) granting PG&E's Petition for Modification, with some exceptions. In this decision, the CPUC ordered that beginning March 1, 2013, PG&E's small and medium agricultural customers that have access to at least 12 months of interval billing data will default to mandatory TOU.[12] The decision also stipulated that small and medium business customers who have had interval-billed electric SmartMeters for at least 12 months default to mandatory TOU rates beginning November 1, 2012. Subsequently, once these small and medium business customers have at least 24 months experience on TOU rates, PG&E will default them to opt-out PDP rates beginning November 1, 2014. Small and medium agriculture customers are not automatically transitioning to PDP, but the rate option is available to them. As with the large customers, all of the small and medium non-residential customers on PDP are safeguarded by twelve months of bill protection.

PG&E launched a pilot in November to approximately 28,000 SMB customers who are scheduled to default to PDP in 2014. The objective of this effort was to test how successful web or email based education could be in driving an informed decision regarding participation in PDP. In addition, the pilot would serve as an in market test for the effectiveness of distinct messaging related to PDP. The pilot consisted of an email campaign and website that provided education about PDP and the approaching transition, personalized summer season use and insight into how the customer may perform on the rate, along with information about bill protection and other program features. The website also guided customers through the process of enrolling in PDP or opting-out of the rate. Customers who enroll in PDP will be joining the program in time for the 2014 summer season. As part of the pilot, these customers will receive in-season email support that prepares them for PDP event days and provides feedback on their energy use after each PDP event day, along with tips and recommendations for shifting or curtailing their use. Customers who opt-out of PDP will be removed from the 2014 transition process.

In CPUC Decision Adopting Local Procurement Obligations for 2012 and Further Refining the Resource Adequacy (RA) (D.11-06-022), PG&E was ordered to change the operating hours for PDP from 2 PM – 6 PM to 1 PM – 6PM to align with RA requirements. PG&E proposed this in its 2012 Rate Design Window, which is still awaiting Commission decision.

During 2013, most active PDP customers were large commercial and industrial customers that had been defaulted onto PDP from a pre-existing TOU rate. The PY 2013 evaluation report focused on these default customers, as opposed to small and medium customer who voluntarily enrolled in PDP.[13,14] The number of defaulted customers who remained enrolled in 2013 was 1,717, on average, during the year; of these, 209 had SmartMeters.

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[11] Bill protection allows customers to try the PDP program risk free for one year. If at the conclusion of the first year on PDP, the customer's cumulative charges under PDP are higher than they would have been under their otherwise applicable tariff, they receive a bill credit for the difference.

[12] CPUC Decision 11-11-008. Decision Granting in Part and Denying in Part Petitions for Modification of Decision 10-02-032. November 10, 2011, page 3

[13] 2013 Load Impact Evaluation of California's Statewide Non-residential Critical Peak Pricing Program, Nexant: 2014. www.sce.com/applications.

[14] This group of small and medium customers is referred to as the voluntary CPP customers. In 2013, there were 4,204 customers and the great majority of these service accounts are associated with a single business entity and do not respond on event days. These voluntary CPP participants are not included here and they were not included in the evaluation report because they are not representative of the small business or medium C&I populations that will default onto CPP in coming years. Load impacts for these customers are presented in the PG&E electronic ex post load impact table generator; but it is important to remember that their load impacts do not reflect what would be expected from the small business and medium C&I customer classes in the future under default CPP.

2.1.3 Residential and Non-Residential Time-Of-Use (TOU) Rates

PG&E has had TOU rates in place for many years for both residential and non-residential customers. Schedules E-6 and E-7 are residential TOU rates.[15] E-7 is a two-period, five-tier schedule, closed to new customers. It was replaced by E-6, which is a three-period, four-tier TOU rate. Prices during peak periods are substantially higher than during off-peak periods, particularly during summer months (May-October), encouraging customers to shift electricity use away from peak hours. The time-varying rates are in effect every day. While customers on TOU rates have had meters that collect the required TOU data, the introduction of SmartMeters has increased availability of interval data to more customers through the SmartMeter system, allowing more customers to leverage the information from their interval data and understand the effects of different pricing structures. In addition, previously, customers who wanted to go on a TOU rate had to pay for a meter. Not having to pay for that upfront meter cost may be leading to increased adoption.

As of the end of summer in 2013, there were approximately 31,000 customers on the E-6 rate and roughly 66,000 customers on the E-7 rate. Over 80% of the E-6 customers and 20% of the E-7 customers are net metered.[16] The load impact evaluation excluded the impacts of net-metered customers. Therefore, the 2013 ex post evaluation just considers the approximately 60,000 non-net metered customer accounts.[17] In addition, 2013 is the first year that the number of non-net metered customers was large enough to allow for estimation of impacts for E-6 separate from E-7. At the end of July 2012, 67% and 28% of non-net metered E-6 and E-7 customers, respectively, had SmartMeters. At the end of 2013, 96% and 89% of the respective E-6 and E-7 customers that are not net metered had SmartMeters.[18] This report provides the impacts for the subset of customers who went onto the TOU rate after they received a SmartMeter. There were 4,872 such customers in the PY 2013 evaluation year, all of whom were on the E-6 rate.

As discussed in the previous section, TOU rates became mandatory for small and medium business customers starting November 2012, for customers meeting default eligibility, although customers could have voluntarily enrolled on those tariffs prior to the default date. Beginning November 2014, small and medium business customers with at least two years of experience with TOU rates started being subjected to opt-out PDP. TOU rates became mandatory for all small and medium agricultural customers with smart meters installed for a sufficient period of time starting March 1, 2013 and will continue in following years. Some of the TOU rates have both time varying energy and demand charges. Both types of charges provide customers an incentive to reduce demand during peak hours and shift their consumption.

PG&E transitioned approximately 220,000 small business customers and about 5,200 medium business customers from flat pricing structures to mandatory TOU pricing in November 2012. An additional 104,000 small and medium business customers transitioned in November 2013 and 85,000 more customers are scheduled to transition in November 2014. In March 2013, PG&E transitioned roughly 17,800 small and medium agricultural accounts to TOU rates; 15,500 more agricultural customers will transition over the next two years. PG&E assigned customers to the various TOU transition groups based on when the customer's smart meter was installed.

The PY 2013 evaluation considered the customers that switched from flat pricing to TOU pricing in November 2013 or March 2013. All together, there were approximately 243,000 customer accounts distributed as follows: 220,000 small business accounts (91% of the total); 5,211 medium business accounts (2%); and 17,836 agricultural accounts (7%). These enrollment

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[15] Rate schedules EL-6 and EL-7 are Residential Care Program Time-Of-Use Service rates for single-family dwellings where the Applicant qualifies for California Alternate Rates for Energy (CARE) program.

[16] Net metered customers have a specially programmed meter that measures the difference between the amount of electricity generated at the customer's home and the amount of electricity supplied by PG&E to the home over the course of the month. The customer's bill is calculated using this difference.

[17] 2013 Load Impact Evaluation of Pacific Gas and Electric Company's Residential Timebased Pricing Programs, Nexant: 2014. http://apps.pge.com/regulation/SearchResults.aspx?NewSearch=True&CaseID=1403&DocType=&PartyID=9999&fromDate=04%2F01%2F14&toDate=04%2F01%2F14&sortOrder=FileName&currentPage=1&recordsPerPage=100&searchDocuments=Search

[18] Ibid, Table 2-5.

numbers and the impacts reported here exclude those customers who had been on non-residential TOU rates before the SmartMeter deployment.

2.1.4 Peak Time Rebate (PTR) Program

In A.10-02-028, PG&E filed a proposal for two-part PTR (with and without enabling technology) in compliance with D.09-03-026, which addressed PG&E's application for approval of its proposed SmartMeter Program Upgrade (A.07-12-009). This original proposal requested a staged rollout of PTR to eligible customers beginning on May 1, 2011. PG&E filed updated testimony on October 28, 2011[19] proposing a two-year staged rollout of the PTR program with May 1, 2013 as the earliest possible start date. This schedule assumed that the Commission would issue a final decision in September 2012. Hearings were held in April 2012; however no decision has as yet been issued. Meanwhile, after both San Diego Gas and Electric (SDG&E) and Southern California Edison (SCE) rolled out default PTR in 2012, disappointing results reported in 2013 caused the CPUC (in D.13-07-003) to direct these two utilities to revise their PTR programs from default to opt-in programs.[20] On November 1, 2013, PG&E and ORA jointly filed a Joint Motion for Leave to Withdraw PG&E's default PTR proposal as well. On January 27, 2014, an ALJ Ruling and Amended Scoping Memo denied the Joint Motion and required PG&E to file updated testimony by April 1 supporting an opt-in PTR program, in a reopened proceeding. On February 21, 2014, PG&E and ORA filed a Joint Motion requesting that the CPUC immediately suspend the schedule set in the January 27, 2014 Ruling, and then, either reject default PTR on the merits or dismiss without prejudice. On March 6, 2014, the ALJ issued a ruling granting the stay, and indicated that there would be a decision on the substance of the Motion in the near future.

2.1.5 Real Time Pricing Rate (RTP)

This program has not yet been implemented by PG&E. Here, we provide a brief regulatory update on the program decision. On March 22, 2010, PG&E filed its RTP rate proposal with the Commission (Application (A.) 10-03-014) in which a new voluntary RTP tariff option was proposed for all customer classes.[21] Thereafter, the Division of Ratepayer Advocates, the Utility Reform Network and other interveners filed motions requesting that consideration of RTP be suspended until the Commission provided further guidance regarding dynamic pricing options. On March 3, 2011, ALJ Pulsifer granted those parties' joint motion and ruled that "Real Time Pricing issues are deferred pending further notice."[22] The CPUC subsequently closed A.10-03-014 via D.12-10-004, without any further action on PG&E's RTP showing. The Commission has not provided any further guidance related to RTP.

2.1.6 Programmable Communicating Thermostat (PCT) Program

Under the SmartMeter Upgrade D.09-03-026, PG&E is required to incorporate a Home Area Network (HAN) gateway device into advanced electric meters to support in-home HAN applications. Deployment of this technology enables two-way communications with compatible home appliances and automated controls (e.g., programmable communicating thermostats, or PCTs) which can communicate such data as temperature set points, event status, and customer overrides.

In A.07-12-009, PG&E assumed the new Title 24 building code air conditioning standards, which included PCTs, would be effective in 2012. The Title 24-compliant PCTs, whether installed by third parties or customers, would have been available for enrollment in a PG&E direct load control program. However, shortly after PG&E submitted the application, the California Energy Commission withdrew its Title 24 building code air conditioning standards recommendation and

[19] The Administrative Law Judge in Application 10-02-028 revised schedule in an August 2011 Scoping Memo included an updated filing from PG&E in October 2011.
[20] See, Commission [Energy Division] Staff Report: "Lessons Learned from Summer 2012 Southern California Investor Owned Utilities' Demand Response Programs," filed on May 1, 2013 under Decision 13-04-017 per Ordering Paragraph 31.
[21] Large Commercial and Industrial Customers; Medium Business Customers; Small Business Customers; Large Agricultural Customers; Small Agricultural Customers, and; Residential Service Customers
[22] Application 10-03-014. Administrative Law Judge's Ruling Granting Motion to Revise Schedule for Phase III. March 3, 2011. Page 3.

the plans for a PCT direct load control program were put on hold. PG&E will continue to monitor the market and assess opportunities for PCTs in load control programs.

2.2 INFORMATIONAL ENERGY CONSERVATION PROGRAMS AND INITIATIVES

2.2.1 Customer Web Presentment (CWP)

The CWP functionality provides online access to bills, energy usage, interval usage data and energy management and diagnostics tools tailored to customers with PG&E SmartMeters and interval data. It is available through PG&E's online portal, known as My Energy. Once an installed SmartMeter is being read remotely, customers may log onto My Energy to check their energy usage on previous days and learn about ways to save energy. [23] The My Usage tab within My Energy provides customers with a variety of tools, which are made possible by the interval data collected by the SmartMeter. These resources include an overview of the customer's interval (hourly or 15-minute), daily, monthly and yearly energy usage characteristics and energy costs, comparisons with the previous month's bill or the bill from twelve months prior, comparisons with similar homes and efficient homes, and comparisons of usage with the weather.

Beginning in 2010, PG&E has marketed the CWP functionality to customers via the following channels: pre-installation bill inserts to customers who were about to receive a SmartMeter; the SmartMeter Welcome Kit which was replaced by a Transition Booklet; direct mail; email; and an outreach banner on PG&E's home page. For each past campaign, the customer data and resources associated with CWP were marketed as a feature of My Energy. During 2013, PG&E did not have specific CWP or My Energy marketing efforts, but PG&E wove My Energy awareness into a number of other product and program marketing campaigns, including considerable marketing throughout the year for digital services, such as electronic billing, which require customers to set up a My Energy account. Also, in August 2013, PG&E changed to a new paper bill format that includes a graphic similar to My Usage and encourages customers to go online and see their usage information. In addition, PG&E redesigned the My Energy website in December 2013, which made it easier for customers to connect to other tabs, such as My Usage and Energy Alerts.

In November 2011, PG&E changed vendors for the My Energy website, moving from Aclara to Opower. PG&E did not have visibility into how specific service accounts used the My Energy website in 2012. Therefore, the PY 2012 evaluation estimated the number of participants in CWP based on trends from prior program years. The details on customers who accessed My Usage in 2013 and the number of times they viewed the data during the year was made available for the 2013 evaluation. However, the data gap in 2012 still presents challenges since it is impossible to know which customers were first time participants in 2013.

As of the end of 2013, at least 845,800 people have viewed My Usage data and, thus, have been defined as CWP participants. Of those, 719,325 viewed their My Usage data at least once in 2013. A significant number of the CWP participants are also enrolled in Energy Alerts. About 42,845 of the 2013 CWP participants were enrolled in Energy Alerts and received at least one alert in 2013, while the remaining 676,480 CWP participants in 2013 were singly enrolled. The impact analysis in the evaluation report uses a restricted population to estimate savings to avoid double-counting impacts for customers who are also SmartRate or SmartAC participants. The impacts reported here are based on a population of 503,019 singly enrolled CWP participants and 36,509 participants dually enrolled in CWP and Energy Alerts.

2.2.2 Energy Alerts Program

The Energy Alerts Program became operational in June 2010 as an option for PG&E customers with an installed SmartMeter that is being read remotely. The program allows customers to receive advance warning via email, phone, or text message if their electricity usage is projected

[23] Customers without a SmartMeter can still access My Energy to view their billed usage and create a customized energy savings plan.

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to move into higher pricing tiers by the end of the current billing cycle. Projected usage is calculated on the eighth day of the customer's billing cycle, and Energy Alerts are subsequently sent out to those customers whose total usage for the billing cycle is likely to enter the higher (e.g. third or fourth) pricing tiers. Energy Alerts are also sent out when the customer's usage has actually entered any of the higher pricing tiers, with a maximum of four Energy Alerts per service agreement in a billing cycle. This program was implemented pursuant to Ordering Paragraph from the Privacy Decision 11-07-056 required the California IOUs to offer "residential customers bill-to-date, bill forecast data, projected month-end tiered rate, and notifications as the customers cross rate tiers as part of the pricing data provided to customers."

Customers can enroll in Energy Alerts online via the My Energy web site. During the past few years, PG&E has marketed Energy Alerts in a similar manner as CWP and often in parallel with CWP and My Energy communications. In 2013, there were no direct marketing efforts for Energy Alerts, but enrollments continued to increase, most likely due to greater customer awareness of PG&E's digital services accessible through the My Energy website. Specifically, PG&E heavily marketed electronic billing in 2013, and directed customers to My Energy to create an online account. Once online, customers could see the other services offered by PG&E, including Energy Alerts and CWP (viewing usage, obtaining energy saving tips, creating energy management plans). PG&E also redesigned the My Energy home page in December 2013, which made it easier for customers to connect to other often-used functions, such as analyze usage, compare rate plans, and sign up for Energy Alerts.

As of December 31, 2013, there were more than 113,000 customers enrolled in Energy Alerts; 74,462 of these customers received at least one Energy Alert in 2013. Of those receiving at least one alert, 31,617 were singly enrolled and 42,845 also viewed their My Usage data in 2013 and, therefore, were considered dually enrolled in Energy Alerts and CWP during 2013. As described for CWP, the impact analysis in the evaluation report uses a restricted population to estimate savings to avoid double-counting impacts for customers who are also SmartRate or SmartAC participants. The impacts reported here are based on a population of 26,415 singly enrolled Energy Alerts participants and 36,509 participants dually enrolled in CWP and Energy Alerts.

2.2.3 Home and Business Area Network (HAN) Platform

Under the SmartMeter Upgrade filing (D.09-03-026), PG&E has been developing a Home and Business Area Network (HAN) platform for technology enablement whereby HAN devices within a customer's premise securely connect to the HAN gateway on the customer's SmartMeter to obtain near real time usage and cost information and, ultimately, time-based pricing and demand response event notification. This information gives customers the ability to monitor and manage their home energy usage to balance between comfort and cost. PG&E has carried out two phases of the HAN platform to date. Delivery of a third phase will be in 2014.

On March 1, 2012, PG&E began implementing the Initial Rollout phase of its HAN platform, which is also referred as the Demand Response Enablement phase. PG&E implemented Phase 1 pursuant to Ordering Paragraph 11 of CPUC decision 11-07-056, which requires California IOUs to file HAN Implementation Plans. In this phase, 69 In-Home Displays (IHD) were installed in the homes of PG&E employees during a "soft launch" in March. Then, in fall of 2012, 354 additional devices were installed in customer homes in Orinda and Moraga. The purpose of the Initial Rollout was to determine how customers engage with the device and obtain feedback on the processes and ways to optimize and improve the customer experience. The Initial Rollout phase was evaluated in 2013 by Freeman, Sullivan & Co.[24]

In mid-January of 2013, PG&E begin the second phase of the HAN platform, which is referred to as the Early Adopter phase or Self Service model. Phase 2 was funded through the SmartMeter Upgrade decision. In this phase, interested customers went to the HAN website and PG&E checked their eligibility for participating. If eligible, customers were advised to purchase their own device through retail channels. (PG&E tested and approved five devices, but devices are not

[24] Pacific Gas and Electric Company's Home Area Network (HAN) Pilot – Final Report, Freeman, Sullivan & Co., San Francisco, CA: Nov. 11, 2013. http://calmac.org/publications/HAN_Final_Report_FINAL.pdf

restricted to those five.) During the first year of Phase 2 rollout, PG&E was directly involved in loading devices to the system, pairing the devices to the customers' meters, and then enabling the devices. As of February 2014, the HAN device eligibility and registration process became fully automated through the My Energy web portal, allowing the platform to scale and support requests at volume. Now customers log into My Energy, link to their Home and Business Area Network Dashboard, and the system automatically checks their eligibility. If eligible, customers can register and pair their device to the SmartMeter using the self-service portal with no need for PG&E intervention.

Phase 3 was authorized under a separate advice letter dated March 22, 2013 (Advice 4119-E-A). This future phase is referred to as the HAN Demand Response Integration phase. For eligible rates, near real-time pricing will be provided through the SmartMeter to HAN devices, presenting energy pricing over time (time-based rates) or pricing tiers (standard tiered rates). Capabilities will also include bill forecast and bill to date based on current usage patterns, as well as notification of demand response events to the HAN devices. During an initial rollout in the summer of 2014, PG&E will provide test customers with devices; PG&E plans for mass market rollout in early 2015, whereby customers will have to purchase their own devices.

METHODS AND ASSUMPTIONS

This section provides a high-level discussion of the methods and assumptions that are used to calculate the energy savings, demand response load impacts and associated financial benefits for the two categories of SmartMeter enabled programs. The PTR, RTP, and PCT programs are not included in this discussion since those programs have not been approved or implemented.

3.1 SMARTMETER ENABLED DEMAND RESPONSE AND DYNAMIC PRICING PROGRAMS

The CPP (SmartRate and PDP), and TOU (residential and non-residential) programs are enabled or supported by the SmartMeter infrastructure and encourage PG&E customers to temporarily reduce loads during periods in which demand might outstrip supply or the system is constrained. The reported aggregate load impacts are equal to the number of enrolled service accounts multiplied by the per-customer demand response load impacts by program.

Table 1 in Chapter 4 of this report provides the number of participating service accounts, estimated demand response (MW), energy savings (MWh), and financial benefits (in thousands) associated with the programs. The following sections describe the measurement methods and inputs that are used in developing the results.

3.1.1 Service Accounts

During the PG&E SmartMeter deployment period, the number of service accounts available for program participation will be dependent on a billing-ready PG&E SmartMeter. A billing-ready PG&E SmartMeter is defined as a meter which has been installed, communicating, tested, cut-over to operations to allow for billing using interval data.

At the end of 2013, PG&E had approximately 118,000 active enrollments in SmartRate. Of those customers, 79,842 were singly enrolled in SmartRate and 38,302 were dually enrolled in SmartRate and SmartAC.[25] In addition, PG&E had about 1,717 large non-residential customers enrolled on the PDP tariff in 2013; of these, 209 had SmartMeters. For the PY 2013 evaluation period, there were also 4,872 non-net metered residential TOU customers and 243,047 non-residential TOU customers with SmartMeters.

3.1.2 Demand Response

The demand response load impacts were estimated based on the number of participating service accounts and the per customer load impacts for each program. The load impacts reflects the performance of the demand response events in 2013—i.e., ex post load impacts, estimated in a manner consistent with the Load Impact Protocols approved in D.08-04-050. The analysis may incorporate a number of variables including the location of customers by CASIO-defined local capacity areas, weather zones, and customer types. PG&E performed a load impact analysis for all SmartMeter enabled demand response resources. The protocols require that an evaluation plan be developed for each program's load impact evaluation and submitted to the Demand Response Measurement and Evaluation Committee (DRMEC) prior to execution. Load Impact

[25] Since SmartAC is not a SmartMeter enabled program, only the impacts for singly enrolled SmartRate participants are reported in Chapter 4.

evaluation reports for PY 2013 were filed on April 1, 2014 for each active demand response program: SmartRate, PDP, and residential and non-residential TOU. [26,27,28]

For singly enrolled SmartRate participants, the load impact was 0.26 kW per customer averaged across the eight SmartDay events in 2013, or a 16% reduction in per customer load. The aggregate load impact for the program was 20.5 MW for SmartRate-only customers.

For PDP, the evaluation of ex post impacts focused on the large commercial and industrial customers who had been defaulted onto the PDP tariff and who also had SmartMeters, but the impacts exclude approximately 3,000 active PDP accounts with SmartMeters that were telecom companies because those accounts provided little or no load impacts. The average aggregate load impact across the eight events in 2013 was 2.4 MW for the subset of 209 SmartMeter customers, which represents a 10.5% load reduction relative to the reference load; the load impact averaged per SmartMeter customer was 11.3 kW.

The residential TOU impacts were calculated for non-net metered customers with SmartMeters during on-peak hours for the analysis period of November 1, 2012 through October 31, 2013. The estimated average per-customer load reduction was 0.22 kW on average monthly system peak days during the summer, which corresponds to a 20% reduction from the reference load. In addition, the aggregate load reduction during the average monthly summer system peak days was estimated to be 1.07 MW.

For small and medium business and agricultural customers, implementation of mandatory TOU rates resulted in a 33.5 MW demand reduction during summer on-peak hours and a 45.6 MW demand reduction during on-peak hours of the top 5 PG&E system load days in 2013. In addition, the mandatory TOU rates yielded 178.9 GWh in energy savings in 2013. These impacts are for the approximately 243,000 customer accounts that switched to TOU rates in November 2012 or March 2013.

3.1.3 Financial Benefits

Financial benefits will be calculated by adding financial benefits associated with the demand reduction and the energy savings for each program. The demand reduction financial benefits will be calculated by multiplying the demand response times the most recently accepted avoided generation capacity cost. PG&E's most recent GRC Phase 2 settlement value for the avoided marginal generation capacity cost is $57.09/kW-year, publicly submitted on August 16, 2013 in, "Update To Pacific Gas And Electric Company's 2014 General Rate Case Phase II Prepared Testimony" as part of PG&E's A13-04-012.[29]. Once the Commission adopts new values for the avoided marginal generation capacity costs in a subsequent proceeding, PG&E will use those adopted values to quantify the financial benefits in the annual report. To the extent that the Commission requires different (than those indicated above) marginal generation costs to be used for various programs, PG&E will use the latest approved value to calculate the financial benefits.

3.2 SMARTMETER ENABLED INFORMATION ENERGY CONSERVATION PROGRAMS AND INITIATIVES

The PG&E SmartMeter enabled Customer Web Presentment, Energy Alerts Program, and Home and Business Area Network platform provide information to the participant on their daily energy usage by leveraging interval data, thereby empowering the participant to take steps to reduce to

[26] 2013 Load Impact Evaluation of Pacific Gas and Electric Company's Residential Timebased Pricing Programs, Nexant: 2014. http://apps.pge.com/regulation/SearchResults.aspx?NewSearch=True&CaseID=1403&DocType=&PartyID=9999&fromDate=04%2F01%2F14&toDate=04%2F01%2F14&sortOrder=FileName&currentPage=1&recordsPerPage=100&searchDocuments=Search

[27] 2013 Load Impact Evaluation of California's Statewide Non-residential Critical Peak Pricing Program, Nexant: 2014. www.sce.com/applications.

[28] 2013 Evaluation of PG&E's Mandatory TOU Rates for Small and Medium Non-residential Customers, Nexant: 2014. .

[29] Line No. 1 in Table 2-3 , "Marginal Cost" in Update to PG&E's 2014 General Rate Case Phase 2, August 16, 2013 Prepared Testimony (A.13-04-012).

conserve energy. The energy impacts were evaluated according to the guidelines presented in the California Energy Efficiency Evaluation Protocols. [30]

Table 2, located in Chapter 4 of this report, provides the number of service accounts, energy conservation (MWh), and financial benefits (in thousands of dollars) associated with the PG&E SmartMeter project enabled energy conservation programs and initiatives on an ex post basis. The following sections describe the measurement methods and assumptions used in developing the energy conservation results.

3.2.1 Service Accounts

During the PG&E SmartMeter deployment period, the number of service accounts will be dependent on a billing ready PG&E SmartMeter meter. The impact analysis in the evaluation report uses a restricted population to estimate savings to avoid double-counting impacts for customers who are also SmartRate or SmartAC participants. The impacts reported here are based on a population of 503,019 singly enrolled CWP participants, 26,415 singly enrolled Energy Alerts participants, and 36,509 participants dually enrolled in CWP and Energy Alerts.

HAN service accounts will be determined based on the number of devices (e.g., In-Home Displays) registered with PG&E. This report presents the impacts from the Phase 1 Initial Rollout. During this phase, devices were installed in the homes of 354 customers.

3.2.2 Energy Savings

For the CWP and Energy Alerts programs, ex post energy savings for 2013 were estimated by multiplying average per-participant energy savings for appropriate subpopulations of customers by the corresponding number of participating service accounts for those subpopulations. Impacts for the subpopulations were then combined to develop overall impacts for three groups: 1) singly enrolled CWP participants; 2) singly enrolled Energy Alerts participants; and 3) participants dually enrolled in CWP and Energy Alerts. EnerNOC's evaluation report in Attachment A provides detailed descriptions of the statistical methods used for estimating CWP and Energy Alerts impacts and presents results at the subpopulation and program levels. The estimated aggregate energy savings impacts are 0 MWh for singly enrolled CWP participants, 7,064 MWh for singly enrolled Energy Alerts participants, and 10,732 MWh for dually enrolled participants.

For the HAN platform for technology enablement, the Phase 1 Initial Rollout impacts were evaluated on an average daily per-participant basis during the pilot period of November 1, 2012 through April 30, 2013. The average daily impacts were estimated with statistical techniques using a control group that was matched with the treatment group by a propensity score matching procedure. The analysis yielded an average per-participant energy savings of about 1.55 kWh per day. Freeman, Sullivan & Co.'s evaluation report provides a detailed description of the methods and results for estimating the HAN Phase 1 energy savings impacts. [31]

3.2.3 Financial Benefits

Financial benefits will be calculated using the same methodology as the demand response financial benefits described previously. However, instead of using an avoided marginal generation capacity cost, the calculation for conservation programs will use an avoided generation energy costs of $51.23/MWh.[32]

[30] California Energy Efficiency Evaluation Protocols, prepared for the California Public Utilities Commission, April 2006.

[31] Pacific Gas and Electric Company's Home Area Network (HAN) Pilot– Final Report, Freeman, Sullivan & Co., San Francisco, CA: Nov. 11, 2013. http://calmac.org/publications/HAN_Final_Report_FINAL.pdf

[32] Line No. 2 in Table 2-2 under the Secondary Distribution column, "Marginal Cost" from PG&E's 2014 General Rate Case Phase 2, August 16, 2013 Update to Prepared Testimony (A.13-04-012).

RESULTS

Table 1 and Table 2 provide the PY 2013 demand response and energy conservation results, respectively.

Table 1 PG&E SmartMeter Program Enabled Demand Response Programs Subscription Statistics: December 31, 2013

Demand Response Program	Service Accounts[33]	Demand Reduction		Energy Savings		Total Financial Benefits (thousands)
		Aggregate Load Impact[34] (MW)	Financial Benefits[35] (thousands)	Energy Savings[36] (MWh)	Financial Benefits[37] (thousands)	
Singly enrolled SmartRate	79,842[38]	20.5[39]	$1170.3	0	$0	$1170.3
PDP	209[40]	2.4[41]	$137.0	0	$0	$137.0
Residential TOU	4,872[42]	1.07[43]	$61.1	0	$0	$61.1
Non-residential TOU	243,047[44]	33.7[45]	$1,923.9	178,900[46]	$9,165.0	$11,088.9
Total	**327,970**	**57.7**	**$3,292.3**	**178,900**	**$9,165.0**	**$12,457.3**

[33] Number of service accounts enrolled in the program who have a billing ready PG&E SmartMeter meter (installed, communicating, and cut-over to operations to allow for billing using interval data).

[34] Program MWs equal the sum of each enrolled participant's interruptible/curtailable load.

[35] Financial benefits (in thousands of dollars) = total DR load reduction (kW) x accepted avoided marginal generation capacity costs per kW-year ($57.09/kW-year). This cost figure comes from the Transmission column of Line No. 1 in Table 2-3, "Marginal Cost" in Update to PG&E's 2014 General Rate Case Phase 2, August 16, 2013 Prepared Testimony (A.1304-012).

[36] Energy savings will be calculated based on the results of the Annual Load Impact Analysis for each program.

[37] Financial benefits = energy savings (kWh) x avoided generation energy costs (in thousands of dollars).

[38] Only the impacts for singly enrolled SmartRate participants are included here. Dually enrolled SmartRate and SmartAC impacts are excluded since SmartAC is not a SmartMeter enabled program.

[39] The aggregate load impact of 20.5 MW represents the average load reduction during the event period across the eight events.

[40] The PDP customer counts and impacts reported here exclude the following: 1) accounts that do not have SmartMeters, and 2) small business and medium C&I customers who enrolled on CPP on a purely voluntary basis.

[41] The aggregate load impact of 2.4 MW represents the average load reduction during the event period across the eight events.

[42] The value of 4,872 represents non-net metered residential TOU accounts who had SmartMeters prior to joining the TOU rate All of these accounts were on schedule E-6. This value was calculated by multiplying the number of non-net metered E6 customers included in the PY 2013 evaluation (5,075) by 96%. According to Table 2-5 in the evaluation report, 96% is the percentage of non-net metered E6 customers with SmartMeters.

[43] The aggregate load impact of 1.07 MW is the average load reduction on monthly system peak days for summer months for non-net metered customers with a SmartMeter.

[44] The value of 243,047 represents the accounts with SmartMeters that transitioned to mandatory TOU rates in November 2012 or March 2013. This enrollment number and the impacts reported in this table exclude those customers who had been on non-residential TOU rates before the SmartMeter deployment.

[45] The aggregate load impact of 33.7 MW represents the average load reduction during on-peak hours (12-6 PM) during the summer period of May 1 to October 31, 2013.

[46] The value of 178,900 MWh represents the 2013 annual energy savings for customers with SmartMeters who transitioned to the TOU rate during the 2013 evaluation period. We have included the energy savings only for Non Res TOU and not for any other Dynamic Pricing program, because the energy savings associated with Non Res TOU were substantial.

Table 2 PG&E SmartMeter Program Enabled Energy Conservation Programs Subscription Statistics: December 31, 2013

Energy Conservation Program	Service Accounts	Energy Savings		Demand Reduction		Total Financial Benefits (thousands)
		Energy Savings (MWh)	(thousands)	Load Impacts[47] (MW)	Financial Benefits[48] (thousands)	
Singly enrolled CWP	503,019[49]	0	$0	0	$ 0	$0
Singly enrolled Energy Alerts	26,415[50]	7,064	$362	0	$0	$362
Dually enrolled CWP and Energy Alerts	36,509[51]	10,732	$550	0	$0	$550
Home and Business Area Network	354[52]	99[53]	$5.7	0	$0	$5.7
Total	566,297	17,895	$917.7	0	$0	$917.7

[47] Demand reductions for the energy conservation programs will be calculated based upon an analysis consistent with that requird by the Energy Efficiency Measurement and Evaluation Protocols.

[48] Financial benefits (in thousands of dollars) = total load reduction (kW) x accepted marginal avoided generation capacity costs per kW-year.

[49] Number of Customer Web Presentment service accounts will be calculated based on number of customer signups for access to interval data on PG&E's web site. The actual population of CWP customers who viewed the My Usage webpage in 2013 was 719,325. Of these, 676,480 were singly enrolled in CWP and 42,845 were dually enrolled in CWP and Energy Alerts and received at least one alert in 2013. The impact analysis uses a restricted population to estimate savings to avoid double-counting impacts for customers who are also SmartRate or SmartAC participants. The number of participants presented in Table 2 represents the number of participants in the restricted population.

[50] Number of Tier Notifications Program service accounts will be determined by the number of program enrollments The actual population of Energy Alerts customers in 2013 was approximately 113,000;74,462 of these customers received at least one Energy Alert in 2013. Of those receiving at least one alert, 31,617 were singly enrolled in Energy Alerts and 42,845 were dually enrolled in CWP and Energy Alerts in 2013. . The impact analysis uses a restricted population to estimate savings to avoid doublecounting impacts for customers who are also SmartRate or SmartAC participants. The number of participants presented in Table 2 represents the number of participants in the restricted population.

[51] The impact analysis uses a restricted population to estimate savings to avoid double-counting impacts for customers who are also SmartRate or SmartAC participants. The actual population of dual participants was 51,886 in 2013; 42,845 of these dual participants received an alert in 2013.

[52] Number of Home and Business Area Network (HAN) service accounts will be determined based on number of devices registered with PG&E's HAN program. Devices were installed in homes of 69 PG&E employees and 354 customers. The energy impacts are based on the 354 customer installations.

[53] The treatment period for the pilot was November 1, 2012 through April 30, 2013. The value of 99 MWh represents the savings during the treatment period and was derived by multiplying the average daily impacts from the evaluation report (1.55 kWh) by the number of participants (354) and the number of days in the treatment period (181).

ATTACHMENT | A

PACIFIC GAS & ELECTRIC COMPANY'S SMARTMETER™ ENABLED PROGRAMS: PY 2013 EVALUATION OF CUSTOMER WEB PRESENTMENT AND ENERGY ALERTS

PACIFIC GAS & ELECTRIC COMPANY'S SMARTMETER™ ENABLED PROGRAMS: PROGRAM YEAR 2013 EVALUATION OF CUSTOMER WEB PRESENTMENT AND ENERGY ALERTS

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The report is a corporate document that should be cited in the literature in the following manner:

Pacific Gas & Electric Company's SmartMeter™ Enabled Programs: PY2013 Evaluation of Customer Web Presentment and Energy Alerts, EnerNOC Utility Solutions, Walnut Creek, CA: 2014.

EXECUTIVE SUMMARY

Customer Web Presentment (CWP) and Energy Alerts are two SmartMeter™ enabled informational energy conservation programs available to Pacific Gas & Electric (PG&E) customers. Customer Web Presentment of interval electric usage data is available to customers though PG&E's My Energy web portal. The My Energy website is a single, multi-functional, customer-facing portal that provides customers with tools to help manage their energy usage. The relevant aspect of the portal is the My Usage tab which allows customers who are SmartMeter read and billed to view their electricity usage at a daily or hourly level. Energy Alerts is a program in which participants elect to receive notifications during the billing cycle regarding their electricity usage. PG&E residential customers are billed according to an increasing block rate structure where successively higher tiers of electric usage are billed at successively higher per-kWh rates. Energy Alerts customers are notified for the first time if their bill forecast, calculated on the 8th day of their billing cycle, projects that they will cross into tiers 3, 4, or 5. Customers are subsequently notified after they cross each of those three tiers for a maximum of 4 alerts in each billing cycle.

This report presents the program year 2013 (PY2013) evaluation of ex-post electricity savings associated with each of the two SmartMeter enabled energy conservation programs described above.

BACKGROUND

PG&E began active marketing of both CWP and Energy Alerts early in 2010, with 2013 being the fourth year that the programs have undergone a formal evaluation.

- For PY2010, the evaluators found no detectable savings at the program level for either program.
- During the PY2011 evaluation of the Energy Alerts program, EnerNOC's evaluation team stratified the participants and used direct comparison and regression methods to analyze daily and monthly ex-post savings. Once again, statistically significant savings were not detected for the Energy Alerts program. We hypothesized that the quality of the match may have been an issue that prevented us from identifying savings for Energy Alerts. However, by employing a more granular approach that investigated key subpopulations of participants, the PY2011 CWP program evaluation yielded detectable ex-post savings of 2-3% for the subgroup of CWP customers who accessed the web portal more than 15 times during 2011. The savings were smaller and less consistent for the overall CWP population and for other subpopulations that accessed the web portal fewer than 15 times per year. The findings from PY2011 indicate that highly engaged customers are more likely to be early adopters of energy information, and are also more likely than the general population of participants to be looking for tools to help them manage and reduce their energy usage.
- During the PY2012 evaluation of the CWP and Energy Alerts programs, EnerNOC's evaluation team modified the ex-post analysis approaches to address unique circumstances for PY2012 and to continually improve the evaluation process. Specifically, for the CWP program evaluation, we used an approach that leveraged historic data to augment 2012 data gaps. In addition, to better understand the reasons for undetectable savings from the Energy Alerts program, we conducted a participant survey during the PY2012 evaluation to supplement the ex-post impact analysis and to help inform our sample design strategy. For CWP, we were able to estimate statistically significant ex-

post savings for PY2012 at the population level and within the two highest usage strata. In addition, the PY2012 impact analysis for the Energy Alerts program showed savings at the population level and at each sub group level.

- The PY2013 evaluation presented here employs further refinements to the analysis approaches. We used large samples of participants and stratified based on energy use within the relevant population segments to improve the precision of the results. In addition, we used interval data for the analysis and incorporated daily savings estimates. We also used an improved differencing approach. In previous evaluation years we have used a direct comparison between the participant and control groups. This year we used a difference in differences approach that allowed us to use available pretreatment data to account for the preexisting differences between participant and control groups.

OVERALL APPROACH

The evaluation was conducted in five basic steps:

1. Characterize the participants in each program by examining both enrollment data and level of engagement. Identify customers with dual participation in both CWP and Energy Alerts.
2. Design the treatment samples for single enrollment in each program and for dual participation by segmenting the population by the aspects of participation that have been shown to be correlated with savings in previous evaluations and then by stratifying based on energy use within relevant population segments. For CWP, the segmentation aspects include duration of participation and number of times a participant views the web tools; for Energy Alerts, they include manner in which participants receive alerts and number of alerts received during the 2013 program year.
3. Match the treatment customers with non-participant control customers using a stratified matching strategy employing both demographic and pretreatment energy usage data. Conduct matching in two stages: first with monthly billing data to obtain a three-to-one control-to-participant match and second with hourly on-peak and off-peak interval data to create a one-to-one control-to-participant match for a series of day types.
4. Estimate the energy savings for each program at the segment and population levels for each month and the entire program year using a difference in differences analysis approach with interval data.
5. Estimate the demand savings for each program at the segment and population levels for each day type using a difference in differences analysis approach with interval data

CWP SAVINGS ANALYSIS

As described above, our PY2013 savings analysis method was similar to the PY2012 approach, but was refined and enhanced to obtain more accurate savings estimates. We examined the savings for the entire population of program participants, as well as for eight subpopulations:

- Continuing participants who accessed the web portal with the following frequencies during the year:
  - 16 or more times; 7 to 15 times; 2 to 6 times; Once
- New users who accessed the web portal with the following frequencies during the year:
  - 16 or more times; 7 to 15 times; 2 to 6 times; Once

For some of the CWP population segments, we sampled participants and stratified based on average monthly energy use to improve the precision of the results; for other segments, we used all participants with available data in the analysis.

CWP Energy Savings

Table E-1 shows the estimated average per-participant monthly differences (or savings) between the treatment and control groups and the percent impacts for both singly and dually enrolled participants. A positive difference indicates savings in the treatment group, and a negative difference indicates higher usage in the treatment group. The annual total is simply the sum of each statistically significant point estimate and the associated percentage impact is based on the total estimated usage for the year —that is, the adjusted control group load. The confidence interval is also shown, as a +/- kWh value at the 95% level.

For singly enrolled CWP participants, we do not detect statistically significant savings in any months other than February, where participants seem to be using more, on average, than their matched control group. We believe that this estimate is attributable to bias, and does not reflect effects of the program. In fact, we analyzed the program at an annual level and found no statistically significant savings for singly enrolled CWP participants. As a result, we ignore those estimates in our final calculations of energy savings and assume they are zero. Dually enrolled CWP participants, on the other hand, show statistically significant savings for all months of the year. The program level savings for singly enrolled CWP participants, excluding February, is 0%. Dually enrolled participants are saving, on average, 3.33 % across PY 2013.

To assess annual energy savings, we estimate savings at the monthly level using the difference in differences methodology. This provides an average per-participant savings estimate for each month in 2013. The annual total is simply the sum of each statistically significant point estimate and the associated percentage impact is based on the total estimated usage for the year —that is, the adjusted control group load.

Table E-1 Average Per-Participant Energy Savings: All CWP Participants

Month	All Singly Enrolled Participants n= 503,019			All Dually Enrolled Participants n= 36,509		
	Savings (kWh)	CI +/- 95% (kWh)	% Impact	Savings (kWh)	CI +/- 95% (kWh)	% Impact
January	8.59	12.23	1.15%	22.94	16.02	2.86%
February	-23.08	19.17	-4.14%	15.14	14.85	2.44%
March	-6.58	16.33	-1.16%	18.60	11.62	2.98%
April	-7.43	10.32	-1.39%	15.48	9.59	2.61%
May	-6.48	12.71	-1.09%	26.73	9.87	3.96%
June	-3.22	12.30	-0.46%	28.64	13.09	3.43%
July	-2.97	13.46	-0.37%	40.76	14.19	4.11%
August	-4.39	12.10	-0.60%	37.87	12.19	4.25%
September	-3.62	10.19	-0.56%	29.50	9.79	3.92%
October	-7.29	8.94	-1.32%	16.32	8.00	2.67%
November	-4.82	9.73	-0.84%	23.47	8.82	3.68%
December	-11.69	14.66	-1.66%	18.50	12.22	2.35%
Annual Total	**0.00**[1]		**0.0%**	**293.96**		**3.33%**

Blue indicates statistically significant savings.

[1] See text above table. Unfortunately, because we have no information regarding participation during the gap, we are unable to correct for this potential bias. In order to determine if it would be appropriate to assume that February is truly an anomalous month, we tested the overall annual savings estimate for the singly enrolled participants for significance, and found that at the annual level, the small increase in usage is NOT statistically significant. In light of these results, we believe it is appropriate to conclude that the one statistically significant estimate in February is attributable to bias, and does not reflect effects of the program. Therefore, we ignore those estimates in our final calculations of energy savings and assume they are zero.

In order to estimate the overall energy savings for the CWP program, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the energy savings for the two subpopulations. It is important to note that savings for dual participants will also be counted in the Energy Alerts section. We present the overall program level energy savings below in Table E-2.

Table E-2 Total Annual CWP Energy Savings: All CWP Participants[2]

Subpopulation	Number of Participants[3]	Annual Savings (kWh per customer)	Total Savings (MWh)
Singly Enrolled Participants	503,019	0	0
Dually Enrolled Participants	36,509	294	10,732
Total CWP Energy Savings	**539,528**	**20**	**10,732**

CWP Demand Savings

In addition to the monthly analysis, EnerNOC evaluated the daily impacts at the program level by using the difference in differences methodology on hourly data. We created eight specific day types, shown in the following table, and provide information on t he on- and off-peak savings estimates for each day type. The day types were based on the distribution of average daily temperatures in each participant and control group customer's representative weather station . The development of the day types i s describ ed in more detail in Chapter 3 . The on-peak period is defined as the hours between 12:00p and 6:00p. When we calculate the per -participant demand savings in the tables in this section, we include all hours regardless of significance. [4]

At the program level , we were unable to detect statistically significant savings across any day type for the singly enrolled participants. For the dually enrolled participants, by contrast, we were able to detect statistically significant savings during all day types in both the on- and off-peak periods. Still, the savings presented for the dually enrolled participants below in Table E -3 are very small ranging between 2 and 4 percent with a magnitude of less than 1/10 th of a kW.

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[2] We do not include confidence intervals for the total annual savings estimates. We perform the analysis at the monthly level, and then we add the point estimates that are statistically significant across the months. This provides us with a valid estimate of the annual savings, and valid confidence intervals at the monthly level, however, we cannot similarly add the confidence bands across months to obtain an annual confidence interval. One must take into account the covariance between months. Given the complexity of the calculation, we did not estimate the annual confidence intervals here taking into account the covariance. However, one can be sure, given that each individual month is statistically significant, that the overall estimate will also be statistically significant.

[3] Refer to table 3-23 for a description of the participant counts used to estimate the program level impacts.

[4] We included all hours in the estimate of the on peak impact, regardless of statistical significance, because each is still a valid estimate. The on peak impact is the sum of the estimates, which are each random variables with a mean and a variance. The mean of the sum of the random variables is equal to the sum of the means of the random variables. The drawback of this approach is that because the estimates are correlated, they are not independent, so calculating the variance (and therefore the confidence interval or the significance) of that sum requires the use of all the covariances between all the estimates. The complexity of this process made it impractical here. However, if all or most of the individual estimates are significant, then it is very likely that their sum will also be significant.

Table E-3 Average Per-Participant Demand Savings: All Dually Enrolled Participants

Day Type	All Dually Enrolled Participants n = 36,509			
	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Hot Summer	0.091	4.33%	0.038	2.80%
Typical Summer	0.066	5.52%	0.027	2.84%
Cool Summer	0.034	4.29%	0.020	2.46%
Summer Weekend	0.064	4.29%	0.028	2.68%
Cold Winter	0.040	3.87%	0.023	2.05%
Typical Winter	0.032	3.55%	0.024	2.62%
Warm Winter	0.031	3.63%	0.020	2.47%
Winter Weekend	0.035	3.29%	0.022	2.33%

Blue indicates statistically significant savings.

To estimate the overall demand savings for the CWP program, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the demand savings for the two subpopulations. It is important to note that savings for dual participants will also be counted in the Energy Alerts section. We present the overall program level energy savings below in Table E-4.

Table E-4 Total On-peak CWP Demand Savings: Hot Summer Days

Subpopulation	Number of Participants[5]	Average Impact (kW per customer)	Total Impact (MW)
Singly Enrolled Participants	503,019	0	0
Dually Enrolled Participants	36,509	0.091	3,322
Total CWP Energy Savings	**539,528**	**0.006**	**3,322**

ENERGY ALERTS SAVINGS ANALYSIS

We used all participants with available data in the Energy Alerts analysis . Similar to the CWP approach, we matched first based on pretreatment calendarized billing data and then based on interval data. We then carried out a difference in differences analysis for day types using interval data. We examined the savings for the entire population of program participants , as well as four subpopulations:

- Participants receiving alerts via email
- Participants receiving alerts via SMS text
- Participants receiving more than five alerts annually
- Participants receiving five or fewer alerts annually

Energy Alerts Energy Savings

The monthly estimated average per -participant savings for Energy Alerts are presented below in Table E-5. A positive difference indicates savings in the treatment group, and a negative difference indicates higher usage in the treatment group. The annual total is simply the sum of each statistically significant point estimate and the associated percentage impact is based on the total estimated usage for the year —that is, the adjusted control group load.

[5] Refer to table 3-23 for a description of the participant counts used to estimate the program level impacts.

Customers participating in Energy Alerts show statisticall y significant savings for every month of 2013. Dually enrolled customers save more in May through September whil e singly enrolled customers save more in the remaining months. For both groups, they save on average just over 3% in energy across the year, with dually enrolled participants saving slightly more.

Table E-5 Average Per-Participant Energy Savings: All EAL Participants

Month	All Singly Enrolled Participants n = 26,415			All Dually Enrolled Participants n = 36,509		
	Savings (kWh)	CI +/- 95% (kWh)	% Impact	Savings (kWh)	CI +/- 95% (kWh)	% Impact
January	24.90	7.36	3.28%	22.94	16.02	2.86%
February	23.49	5.94	3.75%	15.14	14.85	2.44%
March	20.47	5.91	3.27%	18.60	11.62	2.98%
April	17.24	5.49	2.88%	15.48	9.59	2.61%
May	23.03	6.20	3.39%	26.73	9.87	3.96%
June	21.52	8.90	2.57%	28.64	13.09	3.43%
July	23.71	9.86	2.42%	40.76	14.19	4.11%
August	22.14	8.27	2.53%	37.87	12.19	4.25%
September	21.19	6.89	2.85%	29.50	9.79	3.92%
October	18.57	5.81	3.02%	16.32	8.00	2.67%
November	24.05	6.19	3.78%	23.47	8.82	3.68%
December	27.11	8.94	3.45%	18.50	12.22	2.35%
Annual Total	**267.43**		**3.05%**	**293.96**		**3.33%**

Blue indicates statistically significant savings.

To estimate the overall energy savings for the Energy Alerts program, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the energy savings for the two subpopulations. It is important to note that savings for dual participants was also counted in the CWP section. We present the overall program level energy savings below in Table E-6.

TableE-6 Total Annual Energy Alerts Energy Savings: All EAL Participants[6]

Subpopulation	Number of Participants	Annual Savings (kWh per customer)	Total Savings (MWh)
Singly Enrolled Participants	26,415	267.43	7,064
Dually Enrolled Participants	36,509	293.96	10,732
Total Energy Alerts Energy Savings	**62,924**	**282.82**	**17,796**

Energy Alerts Demand Savings

In addition to the monthly analysis, EnerNOC evaluated the daily impacts at the program level by using the difference in differences methodology on hourly data. We created eight specific day types, shown in the following two tables, and provide information on the on - and off-peak

[6] We do not include confidence intervals for the total annual savings estimates. We perform the analysis at the monthly level,and then we add the point estimates that are statistically significant across the months. This provides us with a valid estimate of tlh annual savings, and valid confidence intervals at the monthly level, however, we cannot similarly add the confidence bands across months to obtain an annual confidence interval. One must take into account the covariance between months. Given the complexity of the calculation, we did not estimate the annual confidence intervals here taking into account the covariance. However, one can be sure, given that each individual month is statistically significant, that the overall estimate will also be statistically significant.

savings estimates for each day type. The day types were based on the distribution of average daily temperatures in each participant and control group customer's representative weather station. The development of the day types is described in more detail in Chapter 3 . The on-peak period is defined as the hours between 12:00p and 6:00p. When we calculate the per-participant demand savings in the tables in this section, we include all hours regardless of significance.[7]

At the program level, we were able to detect statistically significant savings across most day types for both the singly and dually enrolled participants. The average impacts in all cases are small, ranging from about 2% to 4.5% for singly enrolled participants and from 2% to 5.5% for dually enrolled participants.

Table E-7 Average Per-Participant Demand Savings: All Singly Enrolled Participants

Day Type	All Singly Enrolled Participants n = 26,415			
	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Hot Summer	0.048	2.37%	0.032	2.36%
Typical Summer	0.041	3.48%	0.024	2.51%
Cool Summer	0.025	3.10%	0.021	2.59%
Summer Weekend	0.044	2.99%	0.024	2.38%
Cold Winter	0.045	4.37%	0.042	3.78%
Typical Winter	0.030	3.44%	0.031	3.43%
Warm Winter	0.039	4.51%	0.028	3.41%
Winter Weekend	0.031	2.90%	0.030	3.19%

Table E-8 Average Per-Participant Demand Savings: All Dually Enrolled Participants

Day Type	All Dually Enrolled Participants n = 36,509			
	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Hot Summer	0.091	4.33%	0.038	2.80%
Typical Summer	0.066	5.52%	0.027	2.84%
Cool Summer	0.034	4.29%	0.020	2.46%
Summer Weekend	0.064	4.29%	0.028	2.68%
Cold Winter	0.040	3.87%	0.023	2.05%
Typical Winter	0.032	3.55%	0.024	2.62%
Warm Winter	0.031	3.63%	0.020	2.47%
Winter Weekend	0.035	3.29%	0.022	2.33%

In order to estimate the overall demand savings for the Energy Alerts program, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the energy savings for the two subpopulations. It is important to note that savings

[7] We included all hours in the estimate of the on peak impact, regardless of statistical significance, because each is still a valid estimate. The on peak impact is the sum of the estimates, which are each random variables with a mean and a variance. The mean of the sum of the random variables is equal to the sum of the means of the random variables. The drawback of this approach is that because the estimates are correlated, they are not independent, so calculating the variance (and therefore the confidence interval or the significance) of that sum requires the use of all the covariances between all the estimates. The complexity of this process made it impractical here. However, if all or most of the individual estimates are significant, then it is very likely that their sum will also be significant.

for dual participants was also counted in the CWP section. We present the overall program level energy savings below in Table E-9.

Table E-9 Total Annual On-peak Energy Alerts Demand Savings: Hot Summer Days

Subpopulation	Number of Participants	Average Impact (kW per customer)	Total Impact (MW)
Singly Enrolled Participants	26,415	0.048	1,268
Dually Enrolled Participants	36,509	0.091	3,322
Total Energy Alerts Energy Savings	**62,924**	**0.073**	**4,590**

KEY FINDINGS AND RECOMMENDATIONS FOR FUTURE PROGRAM YEARS

The following were identified as key findings during the PG&E Evaluation of Energy Alerts and CWP.

Overall Findings

Overall, the total annual energy savings from both CWP and Energy Alerts are presented below in Table E-10. As we saw in the respective program results sections, we were not able to estimate statistically significant savings for the singly enrolled CWP participants. The dually enrolled participants and singly enrolled Energy Alerts participants both show an estimated savings between 260 and 295 kWh annually. Overall for both programs, PG&E participants are saving 17,796 MWh.

Table E-10 Total Annual Energy Savings

Subpopulation	Number of Participants	Annual Savings (kWh per customer)	Total Savings (MWh)
Singly Enrolled CWP Participants	503,019	0	0
Singly Energy Alerts Participants	26,415	267.43	7,064
Dually Enrolled Participants	36,509	293.96	10,732
Total Energy Savings	**565,943**	**31.44**	**17,796**

Overall, the total annual demand savings from both CWP and Energy Alerts are presented below in Table E-11. As we saw in the respective program results sections, we were not able to estimate statistically significant savings for the singly enrolled CWP participants. The dually enrolled participants and singly enrolled Energy Alerts participants both show an estimated savings between 0.045 and 0.095 kW on hot summer days. Overall for both programs, PG&E participants are saving 4.5 MW on a hot summer day.

Table E-11 Total Annual On-peak Demand Savings: Hot Summer Days

Subpopulation	Number of Participants	Average Impact (kW per customer)	Total Impact (MW)
Singly Enrolled CWP Participants	503,019	0	0
Singly Energy Alerts Participants	26,415	0.048	1,268
Dually Enrolled Participants	36,509	0.091	3,322
Total Energy Savings	**565,943**	**0.008**	**4,590**

Customer Web Presentment Findings

- Based on our analysis this year, it appears that singly enrolled CWP participants are not saving any energy, however, as we mentioned above we believe that our inability to detect savings may be the result bias. Large ga ps in the data may be inhibiting our matching process and preventing us from detecting savings in the CWP population.
- Dually enrolled CWP participants saved a total of 10,732 MWh during 2013, or 294 kWh per participant, for an average annual impact of 3.3 %
- Dually enrolled CWP participant have an average demand savings of 0.091 kW (or 4.3%) on a hot summer day. The participants achieved a demand savings of 3.3 MW in 2013.
- Dually enrolled CWP participants are saving energy; however, we believe the majority of the savings in the dually enrolled population to be attributable to Energy Alerts, vs. CWP. However, because of the bias mentioned above, we cannot be sure of this hypo thesis.
- One additional hypothesis that may explain why we were unable to detect savings for the CWP participants is the very large increase in participation. This may at first sound counterintuitive, however both PG&E's marketing efforts and the redesigni ng the interface has made My Usage more visible has significantly increased traffic to the My Usage tab. This could result in many more customers viewing the website out of curiosity, but fewer customers actually engaging with and making modifications in behavior based on the information provided.

Energy Alerts Findings

- Nearly all of the savings for the Energy Alerts program is attributable to participants receiving 5 or fewer alerts in 2013.
- Savings is very comparable between singly enrolled and dually e nrolled participants, with dually enrolled participants saving only slightly more, on average, than singly enrolled participants.
- Singly enrolled Energy Alerts participants saved a total of 7,064 MWh during 2013, or 267 kWh per participant, for an average annual impact of 3.0%.
- Singly enrolled Energy Alerts participants have an avera ge demand savings of 0.048 (2.4%) on a hot summer day. The singly enrolled Energy Alerts participants in total achieved a demand savings of 1.3 MW in 2013.
- Dually enrolled Ener gy Alerts participants saved a total of 10,732 MWh during 2013, or 294 kWh per participant, for an average annual impact of 3.3% .
- Dually enrolled Energy Alerts participant have an average demand savings of 0.091 kW (or 4.3%) on a hot summer day. The dually enrolled Energy Alerts participants in total achieved a demand savings of 3.3 MW in 2013.
- The incremental effect of CWP participation for an Energy Alerts participant can be estimated at approximately 26 kWh annually, and 0.043 kW, however these estimates are so small that they fall within our typical confidence intervals, and are not likely to be statistically significant.
- We did not see any statistically significant savings for those participants that receive more than five alerts per year. We believe t hat this may be a result of participant indifference or fatigue as a result of receiving many alerts. Additionally, i n many cases those with large homes, or high AC use due to location, will be unable to move out of the higher tiers, and will continue to r eceive alerts regardless of any changes made in the home.

Recommendations for Future Program Years

The following were identified as recommendations for future program years:

- Because we cannot be sure why we were unable to detect savings for singly enrolled CWP participants, we cannot recommend making changes to the program based on the 2013 evaluation.
- We recommend looking closely at new CWP participants in 2014, for whom PG& E will have complete data, to determine if the program impacts are truly dropping or if bias resulting from a missing data is obscuring the savings estimates.
- Overall, given the very high participation rate for CWP, we recommend that PG&E continue to offe r and enhance their customer interface, even if we cannot attribute savings directly to those customers.
- Energy Alerts appears to be a very successful program, however, we have not accounted for the possibility of double counting between Energy Alerts and PG&E's other conservation and Energy Efficiency programs. It is very likely that participants that are interested in Energy Alerts would also be interested in other PG&E programs, and therefore some portion of the savings we attribute to Energy Alerts is likely attributable to other programs.
- Given the proportion of program savings attributable to participants receiving fewer than five alerts, we would recommend marketing Energy Alerts to customers with a monthly usage that borders tiers two and three sev eral months out of the year. These are the participants that seem to be able to most effectively take advantage of the Energy Alerts.
- The Energy Alerts population has been fairly consistent and stable over the last three evaluation years, we would therefore conclude that Ene rgy Alerts participants are not only saving energy but getting value from the program.

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OVERVIEW

1.1 PROGRAM BACKGROUND

This report includes the ex-post Evaluation of Pacific Gas and Electric Company's (PG&E's) SmartMeter™ Enabled Programs for the Program Year 2013 (PY2013). The report provides an estimation of the energy savings for two SmartMeter™ enabled informational energy conservation programs:

- **Customer Web Presentment** – In this program, interval electric usage data is available to customers though the Customer Web Presentment (CWP) pages of PG&E's My Energy web portal. The My Energy website is a single, customer-facing portal with many different functions and tools beyond the scope of this evaluation. The relevant aspect of the portal is the My Usage tab which allows customers who are SmartMeter™ read and billed to view their electricity usage at the daily or hourly level.
- **Energy Alerts** – In this program, customers can sign up for Energy Alerts to receive notifications during the billing cycle about energy usage. PG&E customers are billed according to an increasing block rate, where successively larger tiers of energy usage are billed at successively higher per-kWh rates. Energy Alert customers are notified for the first time if their bill forecast, calculated on the 8th day of their billing cycle, projects that they will cross into tiers 3, 4, or 5. Customers are subsequently notified after they cross each of those three tiers for a maximum of 4 alerts in each billing cycle.

PG&E began active marketing of both CWP and Energy Alerts early in 2010 and this is the fourth year that the programs have undergone a formal evaluation. It is important to note that the results of the past evaluations were considered in the objectives and design of this year's evaluation.

At the program level, the PY2010 third party evaluator did not report detectable savings for either CWP or Energy Alerts. However, the evaluator noted in the Executive Summary that "there is significant uncertainty in these estimates, so it is possible that the programs could affect usage by 1-2% in either direction."[8]

Similarly, EnerNOC's program evaluation team did not detect savings for the Energy Alerts program for PY2011, despite modifications to the approach to try to improve accuracy by use of SmartMeter interval data and sample design enhancements. However, we were able to detect small savings for the CWP program during the PY2011 evaluation by looking at key subpopulations, with the population of participants accessing the web portal more than 15 times during the year showing statistically significant savings of 2-3%.

During the PY2012 evaluation of the CWP and Energy Alerts programs, EnerNOC's evaluation team once again modified the ex-post analysis approaches to address unique circumstances for PY2012 and to continually improve the evaluation process. Specifically, for the CWP program evaluation, we used a dual approach that leveraged historic data to augment 2012 data gaps. In addition, to better understand the reasons for undetectable savings from the Energy Alerts program, we conducted a participant survey during the PY2012 evaluation to supplement the ex-post impact analysis and to help inform our sample design strategy. For both programs, we focused on achieving the increased precision needed to identify very small changes in energy consumption at the population level by significantly increasing the sample sizes from 6,000 and 3,000, to 20,000 and 35,000, for CWP and Energy Alerts respectively. We also adjusted our

[8] Freeman, Sullivan & Co., 2010 Energy Conservation Evaluation of Pacific Gas & Electric Company's Energy Alerts and Customer Web Presentment Programs, April 29, 2012, p. 2.

matching strategy to nearly eliminate the small bias we saw in PY2011 evaluation. For CWP, we were able to estimate statistically significant ex-post savings for PY2012 at the population level (2% savings) and within the two highest usage strata: those participants accessing the website between 7 and 15 times annually (5% savings), and those accessing the website 16 times or more annually (8% savings). In addition, the PY2012 impact analysis for the Energy Alerts program showed savings at the population level (3% savings), and at each subgroup level, including method of alert delivery (2.7-2.9% savings for text vs. 3.3-3.4% savings for email), and the number of alerts (1.6% savings for more than 5 alerts annually vs. 11.5-12.0% savings for less than 5 alerts annually).

The PY2013 evaluation presented here employs further refinements to the analysis approaches. We used large samples of participants and stratified based on energy use within the relevant population segments to improve the precision of the results. In addition we incorporated interval data into the analysis allowing us to estimate savings at a daily level. We also used an improved differencing approach. In previous evaluation years we have used a direct comparison between the participant and control groups. This year we used a difference in differences approach that allowed us to use available pretreatment data to account for the preexisting differences between participant and control groups.

1.2 RESEARCH OBJECTIVES

The four research objectives for this project are as follows:

- **Estimate Ex-Post Energy Conservation for Customer Web Presentment** – It is hypothesized that customers who are aware of how much energy they are using on a daily basis will be more effective in managing their energy consumption. Therefore, the first research objective is to estimate the effect on customers' monthly energy usage of viewing daily or hourly energy use during the billing cycle both at the program level and within subpopulations that use the website more frequently and are more likely to conserve energy.
- **Estimate Ex-Post Energy Conservation for Energy Alerts** – Because PG&E charges customers for energy use on an inverted block rate schedule, it is hypothesized that if a customer knows when she crosses into a higher priced tier, she will conserve energy in response to the higher price. The second research objective is to estimate the effect of Energy Alerts on customers' monthly energy usage both at the program level and within subpopulations that are more likely to conserve energy. Another part of this objective is to estimate, if possible, the effect of an Energy Alert on daily energy use by comparing participant usage on the day the participant receives an alert and on the day after receiving an alert to determine if there is a detectable change in energy use that is greater than the average daily effect of the program.
- **Estimate Effects of Dual Participation** – The third research objective is to quantify the incremental impact of dual participation in both Energy Alerts and CWP on the energy savings relative to single participation in one program or the other. By studying dual participation, we can assess whether these more highly engaged participants conserve more energy.
- **Estimate Daily Load Shapes and Hourly Savings** – This year's analysis uses interval data, which enables estimates of savings at the hourly and daily levels. Therefore, a fourth objective is to investigate how participation in Energy Alerts and/or CWP influences average hourly demand.

1.3 KEY ISSUES

There are some unique challenges associated with meeting the research objectives defined in this project for PY2013:

- **Data availability for Customer Web Presentment** – During 2011, PG&E selected a new vendor to handle the web presentment of SmartMeter interval usage data. Due to contractual issues with the new vendor, no participant data was available for the 2012 program year.

Therefore, we did not know who the 2012 participants were, nor did we have information on how frequently they accessed their interval data in 2012. However, we do have visibility into the participants and their access to the web portal for 2013. The data gap in 2012 still presents a challenge in that we cannot be sure who was a participant, and who was not during our preferred pretreatment period.

- **Dual participants between programs** – During the 2011 evaluation we discovered that there is significant overlap between the two participant populations. We handled this by post-stratifying both samples to account for dual participants within each sample. During the 2012 evaluation we could not address this issue due to a lack of data for CWP. In the 2013 evaluation we will be able to address the overlap between programs by looking at each population separately: singly enrolled CWP participants, singly enrolled Energy Alerts participants, and dual participants.

In addition, three general challenges have been identified during the past evaluation years. These challenges continue to apply to the PY2013 evaluation:

- **Lack of formal control group** – In a pilot setting, it is often possible to use an experimental design with randomized treatment and control groups to control for self-selection bias. However, when a program is fully deployed, as are CWP and Energy Alerts, a randomized control group is no longer an option.
- **Very small impacts relative to total usage** – Evaluations from the past three program years have indicated that changes in energy use resulting from the programs are small and difficult to detect, falling somewhere in the range of 1% to 3% at the population level.
- **A wide variety of levels of involvement with critical information** – In each program, the level of engagement varies widely across the participants. In addition, a large portion of the participant population is dually enrolled in both the CWP and EA programs. Consideration of the different levels of involvement requires careful consideration in the estimation of savings for both programs.

While it is important to acknowledge the challenges associated with these issues, continual refinement of evaluation methods each year has improved our ability to match treatment and control customers and to detect savings from the programs. However, because we are only able to match treatment to control customers based on observable characteristics, we will never be able to completely duplicate the results of a designed experiment and, consequently, the matching process will inevitably have some degree of bias. This, in turn, will always lead to uncertainty in the savings estimates. These uncertainties must be associated with the evaluation's context, not necessarily the effectiveness of the program. In addition, we did not account for participation in PG&E's many Energy Efficiency (EE) programs. This may introduce bias in our estimates. The bias is present only to the extent that CWP and Energy Alerts participants are more likely than their matched controls to sign up for and participate in EE programs. In this case, we would overstate the savings attributable to CWP or Energy Alerts because some of those savings would already be counted in other EE evaluations.

PROGRAM DETAILS

2.1 PROGRAM MARKETING AND ENROLLMENT

Rollout and marketing of the CWP and Energy Alerts programs began in early 2010, targeting customers with the following mail and email messages.

- Introductory bill inserts were sent to customers who were about to have a SmartMeter meter installed. These in serts described the SmartMeter meters in general, and highlighted ways in which both CWP and Energy Alerts could help customers manage their electricity use. Roughly 800,000 such inserts were sent out from January 2010 through April 2010.
- After SmartMeter installations, a Welcome Kit was sent with further information on the meters and supporting programming. These kits highlighted CWP, but did not mention Energy Alerts. Roughly 1.7 million SmartMeter Welcome Kits were sent out to residential customers from April 2010 through August 2010.
- After September 2010, a Transition Booklet replaced the SmartMeter Welcome Kits with similar information. The Transition Booklet advertised both CWP and Energy Alerts. About 900,000 Transition Booklets were sent to resident ial customers from September 2010 to December 2010.
- In June 2010, an email was sent to about 14,000 customers who had previously indicated interest in the Energy Alerts program. The email announced that the Energy Alerts program was now available.
- The Ana tomy of a Rate mailing was sent to customers who had had bills in tier 3 in August of 2010. This explained the tiered rate structure and again advertised both the CWP and Energy Alerts programs and how they can be used to manage electricity use. About 560, 000 of these mailings were sent out.
- In July 2011, five -hundred thousand emails were sent to non -CARE customers that had a high propensity for crossing tier 3. Then, in October of 2011, an additional 430,000 emails were sent customers with the same charact eristics.
- In June of 2012, approximately 1.3 million emails were delivered promoting My Energy and several of its benefits including My Usage. The emails encouraged recipients to click on a link that took them to the My Energy login page. Approximately 25 % of the emails were opened, and about 2.5% of recipients clicked through the My Energy login page. For the June emails no information is available regarding the number of participants that viewed the My Usage webpage.
- In August of 2012 a second group of 1.2 million emails were delivered promoting My Energy. In this second group there was a direct link to the My Usage through the My Energy website and PG&E was able to identify 1,934 recipients that viewed the My Usage webpage through the link. The 1,934 re presents 5.5% of those that first clicked through to the My Energy Login.
- In addition , the outreach campaign featured banners on PG&E's home page from 6/29/2012 – 7/26/2012. The banners resulted in 624 clicks through to the My Energy Login page.
- In 2013, PG&E did not have focused initiatives to promote My Usage or Energy Alerts directly, but My Energy was heavily promoted, which resulted in a lot of traffic to the My

Energy website. This traffic led to a significant increase in customers viewing the My Usage webpage and in Energy Alerts enrollments due to spillover from accessing My Energy. PG&E promoted My Energy with a variety of approaches such as using the Welcome letter for new customers to direct people to set up an account in My Energy, mentioning My Energy on bill inserts, including a reference to My Energy on electronic bills (e-bills), and featuring My Energy on the PG&E website.

- PG&E also launched a new paper bill in 2013 that prominently featured My Energy. In addition, PG&E restructured the front page of the My Energy website in December 2013, making it easier to navigate the landing site. All the commonly accessed links were placed on top, including the link to sign up for Energy Alerts. After revamping the website, PG&E noted a large increase in e-bill enrollments.
- PG&E had a large push to promote e-billing during the August to December 2013 timeframe. It was marketed on the back of the envelope of paper bills and through a "Channel of Choice" effort that focused on trying to connect customers with PG&E digitally. Customers need to set up a My Energy account for digital services such as e-bill. Once a customer is enrolled in e-bill they receive a monthly notification that their bill is available to be viewed in My Energy. When they access My Energy the summary of the account is on the left and includes details about amounts due, due date, and links to view or pay the bill. On the right hand side of that screen in a very prominent way it provides customers information on ways to save, service requests, payment plans, and My Usage, where customers are provided a link to Energy Alerts, usage analysis and rate comparisons.

2.2 CUSTOMER WEB PRESENTMENT

Customer Web Presentment of usage data is a feature that lives inside the My Energy website, which is a single customer-facing portal with many different functions and tools. Residential and small business customers that are SmartMeter read or billed can view their interval data through tools in the My Usage tab on the website. Our objective was to estimate the effect on customers' monthly energy usage of viewing daily or hourly energy use through the web tools. Only the functions or tools that display customer interval usage data from the SmartMeter system were evaluated within the scope of this project. In addition, to be consistent with PY2010, PY2011, and PY2012 evaluations, the PY2013 analysis focused exclusively on residential customers.[9]

In 2011, PG&E transitioned to a new platform for the web presentment of SmartMeter interval usage data. After the upgrade was complete, technical compatibility and contractual issues associated with the new platform limited PG&E's ability to track detailed customer activity within the web presentment pages. For residential customers, this began in mid-November 2011 and continued through 2012. As such, we have limited visibility into the participants and their activities during 2012; furthermore, we have no visibility into how individual, unique, customers accessed and used the website in 2012. Fortunately, we do have visibility into the participants and their access to the web portal for 2013. However, the data gap in 2012 still presents a challenge in that we do not know who was a CWP participant in 2012.

2.2.1 Enrollment

Figure 2-1 shows the monthly distribution of "new" CWP enrollments during 2013. Typically, an enrollment for CWP consists of accessing the online interval data for the first time. Since we do not know which participants accessed data in 2012, the values in the figure reflect the customers who enrolled for the first time during the given month in 2013 plus any of those who accessed data for the first time in 2012 and then accessed the data again in the given month in 2013. For example, for January, the value of 155,205 is partially brand new participants viewing for the first time in January 2013, and partially those participants who enrolled for the first time sometime between mid-November 2011 and the end of 2012 and also viewed in January 2013.

[9] Small and medium business customers and agricultural customers can also participant in CWP. When detailed participation data is available for all CWP participants, future evaluations of the program will include these customers at PG&E's request.

This is true for each subsequent month as well. Note that the effect of 2012 participants on the monthly enrollment numbers is likely to have declined during the year. That would explain the relatively large enrollment value in January 2013 when data first became visible again, compared to other months later in the year. By December 2013, we suspect a smaller share of 2012 enrollees would be accessing the data for the first time in 2013. It is important to mention that we have no way of accounting for the subset of customers that may have enrolled in 2012, but did not view the data in 2013. In all, there were about 646,000 "new" enrollments in CWP during PY2013.

Figure 2-1 CWP - Graph of New Enrollments by Month for PY2013

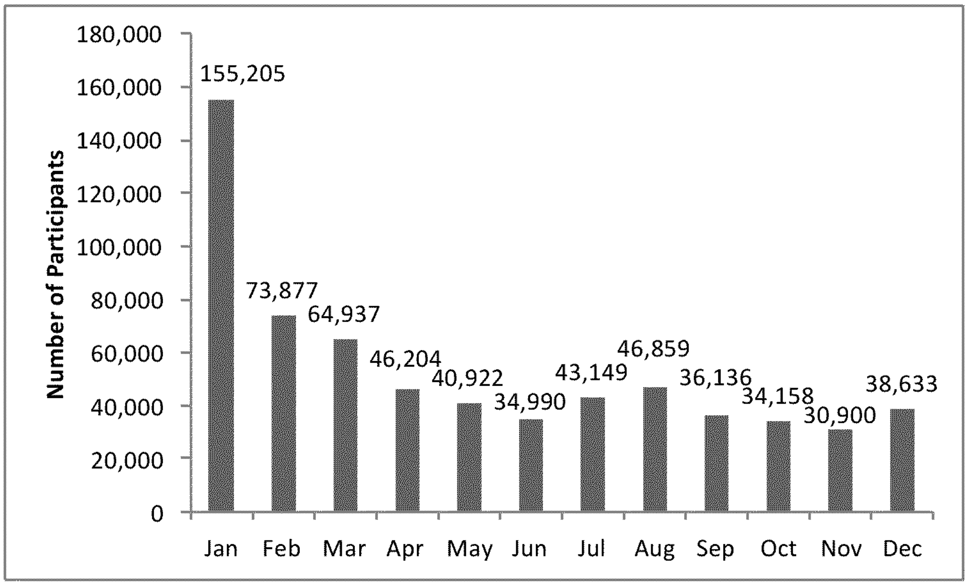
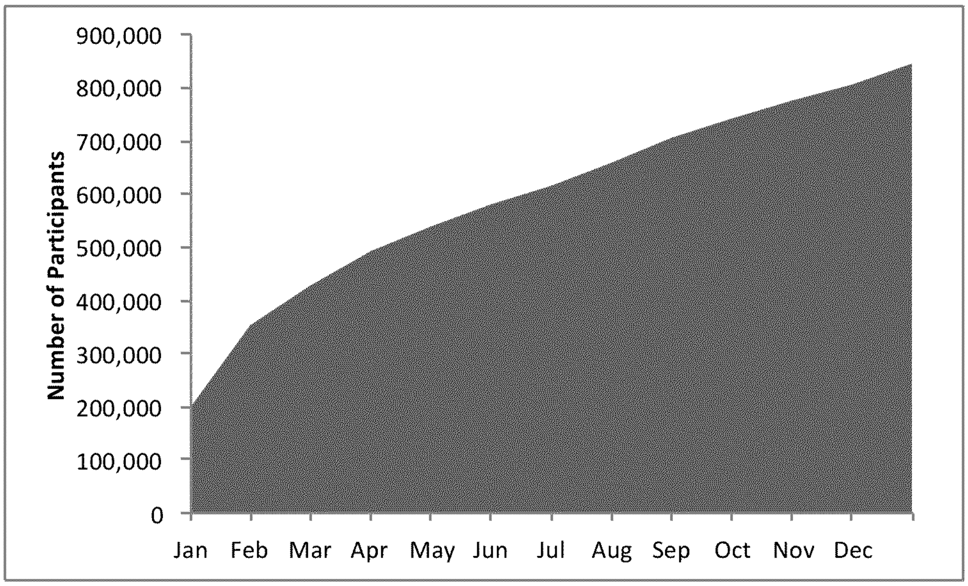


Figure 2-2 shows the cumulative number of participating customers over time. For the reasons described above, this graph does not include those customers, if any, who enrolled in 2012 and then did not access their energy data in 2013. However, it does count customers who enrolled in all years prior to 2012, even if they did not access data in 2013. [10] As of the end of 2013, at least 845,800 people have participated in CWP, including customers singly enrolled in CWP and those enrolled in other PG&E programs such as Energy Alerts, SmartRate and SmartAC. Of those, roughly 85%, or 719,000, viewed their energy data in 2013. [11]

[10] For the purposes of the PY2013 impact analysis, we only consider customers who accessed the web portal during 2013.

[11] The 719,000 includes singly as well as dually enrolled CWP participants who viewed their data in 2013. However, the difference between this (719,353) and the sum of all singly enrolled CWP and dually enrolled CWP in our full population (719,325) is that a portion (28) of the dually enrolled participants have an unknown transport type for their alert.

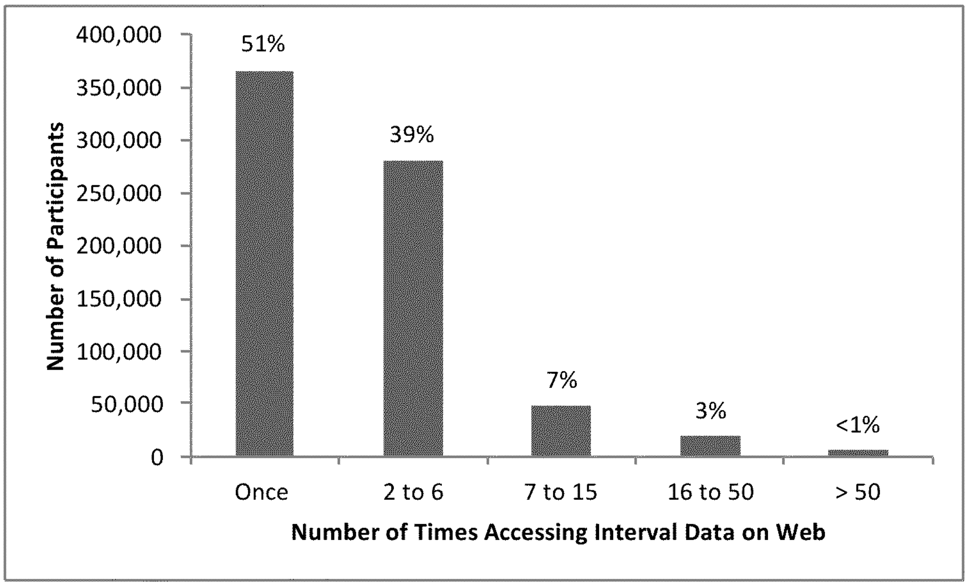
Figure 2-2 CWP - Graph of Cumulative Enrollments over Time in PY2013



2.2.2 Level of Engagement

Figure 2-3 shows the distribution of p articipating customers who engaged with the program at various levels. About half of the participants (51%) only viewed their CWP data once. Another sizeable block of participants (39%) viewed their data between 2 and 6 times. The remaining 10% of the part icipants viewed their data 7 or more times in 2013, including the less than 1% who were very active with 50 or more views. This is consistent with what we have seen in previous evaluations even given the large increase in "new" customers.

Figure 2-3 CWP Engagement - Number of Customer Logins in PY2013



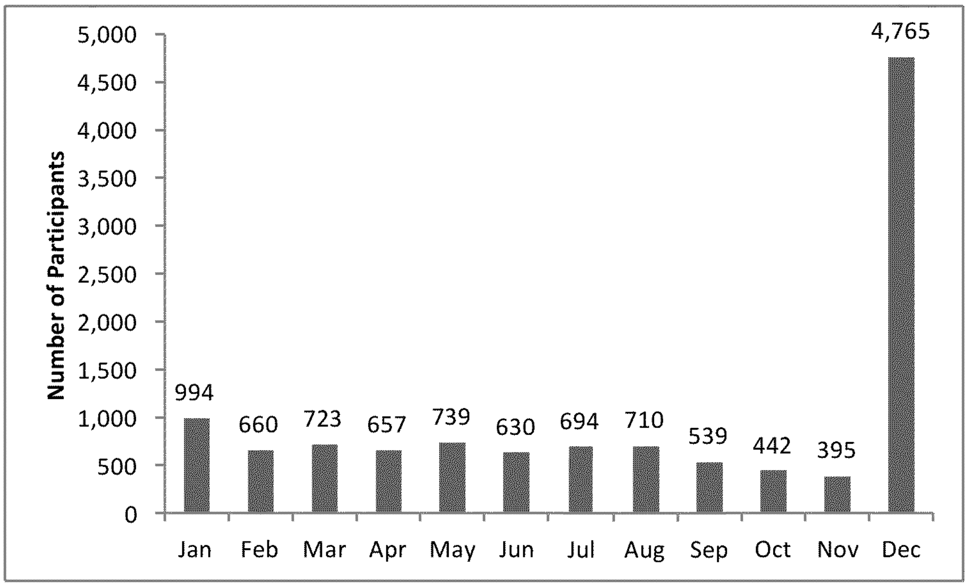
2.3 ENERGY ALERTS

Energy Alerts allows customers to receive advance warning via email, phone, or text message if their electricity usage is projected to move into higher pricing tiers by the end of the current billing cycle. Projected usage is calculated on the eighth day of the customer's billing cycle, and Energy Alerts are subsequently sent out to those customers whose total usage for the billing cycle is likely to enter the higher (e.g. third or fourth) pricing tiers. Energy Alerts are also sent out when the customer's usage has actually entered any of the higher pricing tiers, with a maximum of four Energy Alerts per service agreement in a billing cycle. Energy Alerts are only available for residential customers who are SmartMeter read and billed. CARE [12] customers are only charged for usage on three tiers and are therefore notified only as they cross into tier 3.

2.3.1 Enrollment

As of December 31, 2013, there were approximately 113,000 customers enrolled in Energy Alerts, including customers singly enrolled in Energy Alerts and those enrolled in other PG&E programs such as CWP, SmartRate and SmartAC. See Figure 2-4 and Figure 2-5, respectively, for graphs of the new enrollments and cumulative enrollments throughout 2013. New enrollment rates were highest in the beginning and end of the year. In January, enrollment increased by 994 new customers; in December, enrollment increased by a remarkable 4,765 customers. Between February and November, enrollment grew at an average rate of about 620 new customers per month, fluctuating between about 400 and 720. The exact reason for the large number of new enrollments during January and December is unknown, but PG&E hypothesizes that it could be due to higher winter energy bills causing customers to take notice of their energy usage. A second hypothesis, referenced at the beginning of the chapter, involves a change that PG&E made to its website in December 2013. In the past, the Energy Alerts program page was somewhat hidden, making discovery difficult. PG&E's update made Energy Alerts information much more accessible and we believe this could possibly explain the surge in enrollments. We have observed a similar, but not as pronounced, trend in previous years. Overall enrollment increased by a comparable amount in 2013 (~11,900) when compared with 2012 (~11,500), but the enrollment distribution across months was different because of the high December value.

Figure 2-4 Energy Alerts - Graph of New Enrollments by Month for PY2013



12 The California Alternate Rates for Energy (CARE) program provides discounted energy rates for lowincome residential customers who qualify for the program based on the number of people living in the home and the household's total annual income.

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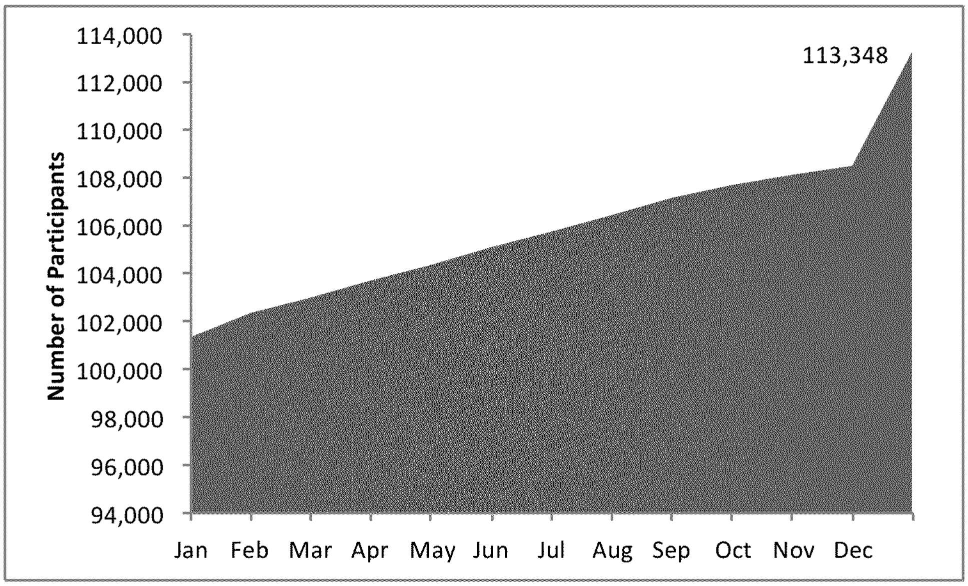
Figure 2-5 Energy Alerts - Graph of Cumulative Enrollments over Time in PY2013



2.3.2 Level of Engagement

Figure 2-6 shows the total number of Energy Alerts dispatched to participants throughout 201 3 and Figure 2-7 shows the number of alerts normalized on a per participant basis. Both graphs display peaks in the number of alerts in summer and winter months, which is expected due to seasonal impacts on energy usage. The peak winter month for alerts was De cember, with 94,484 total alerts, equating to 0. 83 alerts per participant. (The January value of 94,234 total alerts was also relatively high; it actually corresponded to a larger number of alerts per participant (0.9 2) since there were fewer participants enrolled at the beginning of the year.) The peak summer month for alerts was July, with 121,209 total alerts and 1.14 alerts per participant. In general, these trends are consistent with what was observed for 2012.

Figure 2-6 Energy Alerts - Total Number of Alerts by Month in PY2013

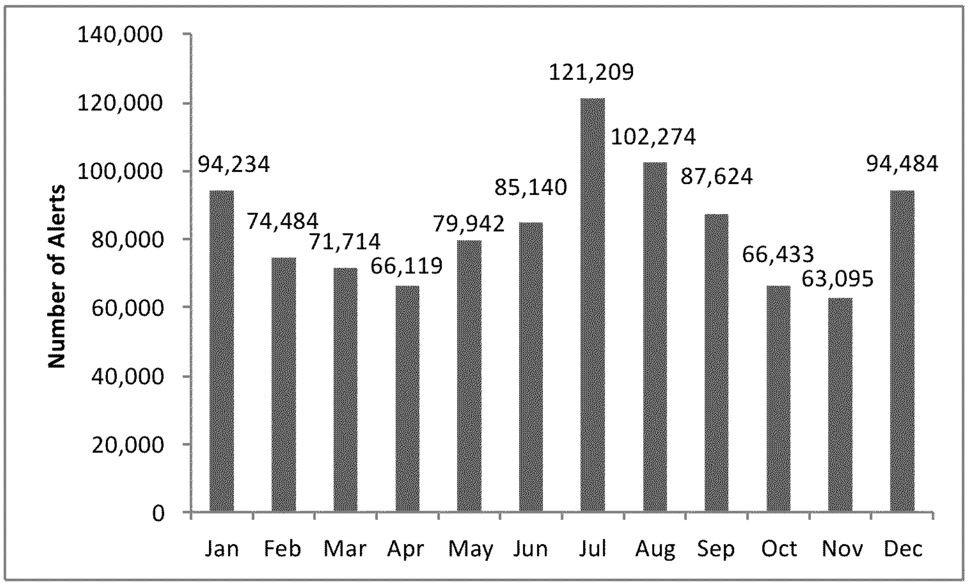


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Figure 2-7 Energy Alerts – Average Number per Participant in PY2013

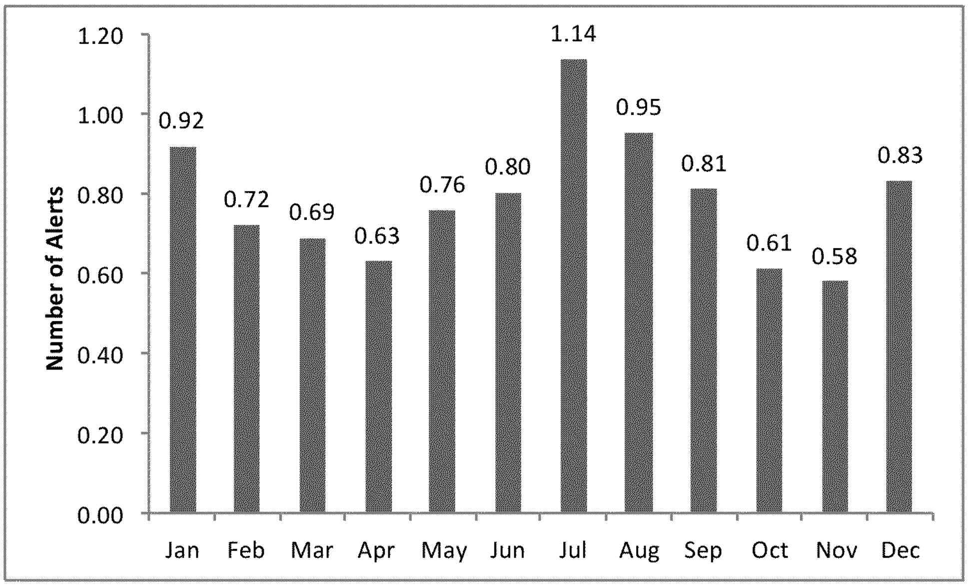
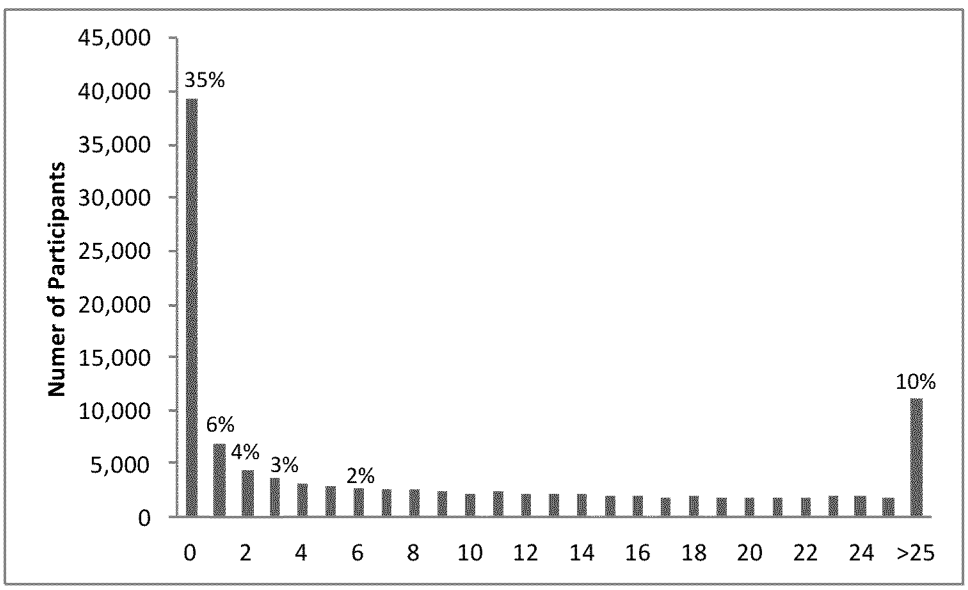


Figure 2-8 below shows the distribution of participating customers by number of alerts received. The largest group (about 39,000 participants, or 35%) did not receive any alerts in 201 3. This statistic is considerably higher than the 2 0-25% of participants who received no alerts in the past program years. The discrepancy is likely due to the fact that a large number of new customers enrolled in December 2013, giving them only a limited amount o f time in the program to receive alerts. The next largest group (about 11,000 participants, or 10%) was at the other end of the spectrum, receiving more than 25 alerts in 2013; this value is comparable to the 10% of participants in this category in 201 2, but is significantly higher than the 3% in this category in 2011. Though this category differs from the other data points in that it encompasses all participants receiving more than 25 alerts as opposed to participants receiving only a single, discrete numb er of alerts, it is notable. The large share of participants in th is greater-than-25-alerts category may be indicative of more high usage customers joining the program over the last two years. Customers who use more energy will cross into the higher tiers more often and receive more alerts. In all, about 74,000 participants received at least one alert in 2013.

Figure 2-8 Energy Alerts Engagement: Number of Alerts Received in PY2013



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2.4 DUAL ENROLLMENT

2.4.1 Enrollment

A large percentage of participants are enrolled in both programs. For the CWP program , a customer is considered to "enroll" the first time they view their interval data on the web. For Energy Alerts, enrollment has the more traditional definitio n of the date the participant signed up for the program. Overall, there were about 73,000 dually enrolled customers, including those who did not use CWP in 2013 and those with zero alerts in 2013. Of those, 51,886 dually enrolled customers participated in CWP and remained enrolled in Energy Alerts in 2013. That means that a pproximately 46 % of Ene rgy Alerts customers also used CWP in 2013, and about 7% of CWP participants who viewed data in 2013 stayed enrolled in E nergy Alerts in 2013. If we consider only those who both received an alert and viewed data in 2013, th e number drops to 42,845 dually enrolled participants who were active in 2013.

2.4.2 Level of Engagement

As noted previously, there were about 719,000 CWP customers who viewed their My Usage data in 2013. Of those, roughly 51,900 were also enrolled in Energy Alerts. Figure 2-9 shows the distribution of dual participating customers that engaged with th e CWP program at various levels during 2013 . As compared to the total population of CWP participants, 4 5% of dual participants viewed their data between 2 and 6 times in 2013; whereas 39 % viewed their data the same number of time s in the total populatio n. Although a sizeable block, 33 % of dual participants, still viewed their data only once in 2013 , this is significantly lower than the 5 1% of participants viewing their data only once in the total population. Consistently, 1 3% of dual participants viewed the ir data 7 or more times in 201 3 compared to only 7% at the entire CWP participant population level. Clearly, dual participants are more highly engaged with the CWP portal, viewing their interval data more often that th e singly enrolled participants.

Figure 2-9 CWP - Graph of Number of Logins per Dually Enrolled Customer in PY2013

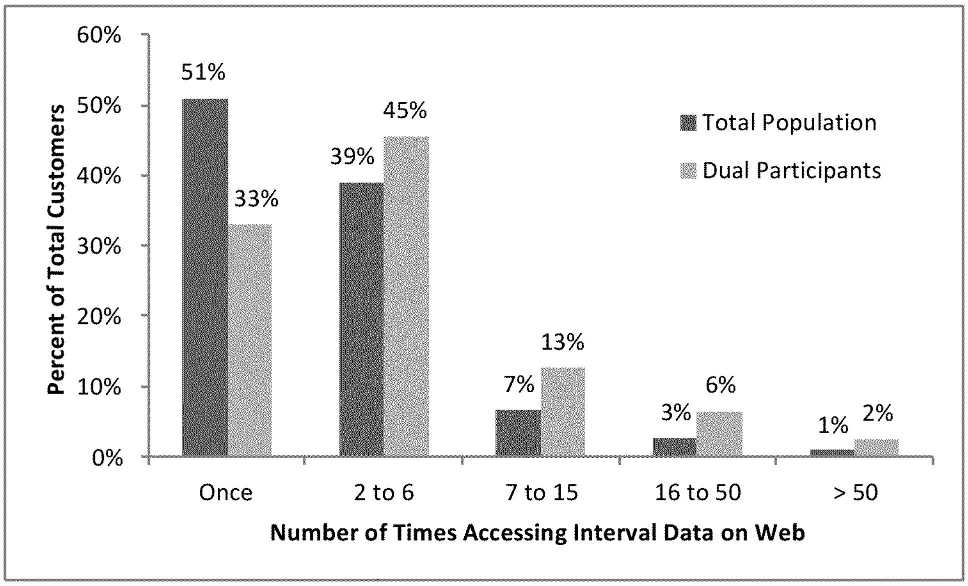
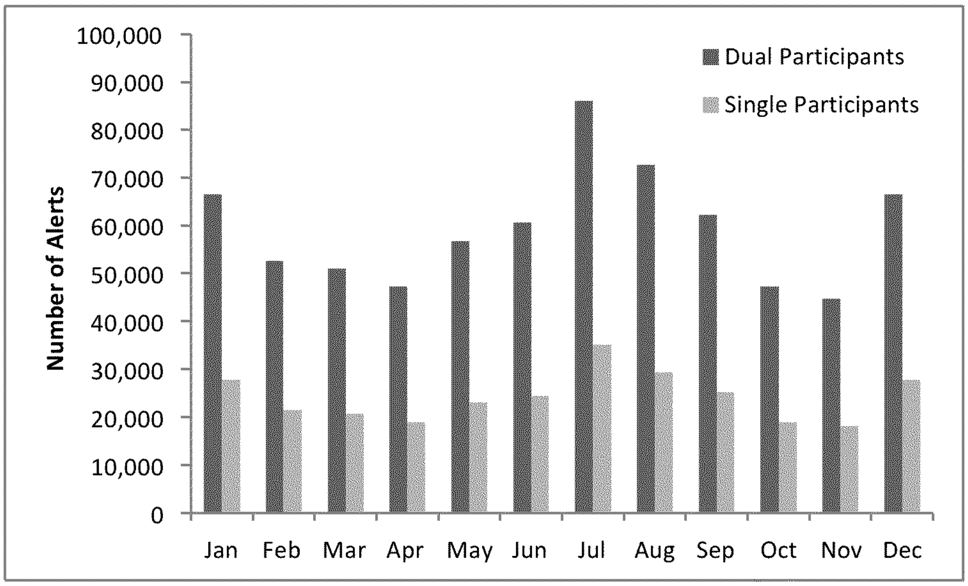


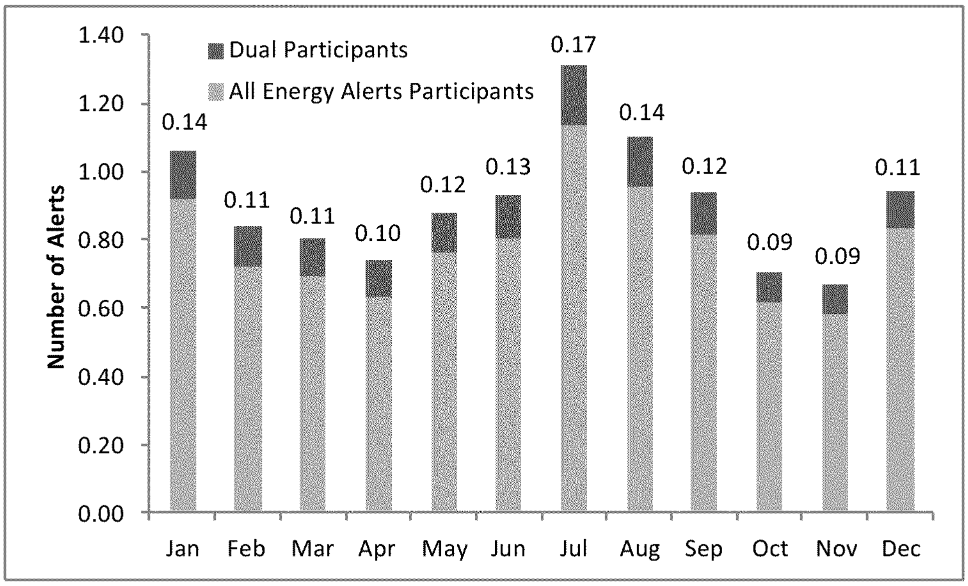
Figure 2-10 shows the total number of Energy Alerts dispatched to dual participants as compared to single participants throughout 2013 . About 31,600 singly enrolled participants received an alert in 2013 and about 42,800 dually enrolled participants received an alert. As seen in the Energy Alerts population at large (Figure 2-6), the number of alerts peaks in the winter and summer months due to seasonal impacts on energy use. In addition, a greater absolute number of alerts were sent out to dual participants.

Figure 2-10 Energy Alerts - Total Number of Alerts for Dually and Singly Enrolled in PY2013



Perhaps the more significant observation is that, when normalized on a per participant basis, there is an increase in the number of Energy Alerts per participant in each month of 2013 , which implies that du al participants are larger energy users . Figure 2-11 shows the incremental increase in average number of alerts per participant compared to the total Energy Alerts participant population. Seasonality again plays a role, with the largest incremental increase for dually enrolled participants (0.17 alerts per participant) occurring in July, followed by August and January (0.14 alerts per participant).

Figure 2-11 Energy Alerts - Average Number of Alerts per Participant in PY2013



2.5 ENROLLMENTS VERSUS PARTICIPANTS

The numbers presented in this chapter are inherently different than those which we will reference in the rest of this report. The values presen ted here represent the actual enrollments in each program, including those who did not view or did not receive an alert in 2013 or are otherwise ineligible to be included in the evaluation. In this chapter, we discussed the overall CWP enrollment, overall Energy Alerts enrollment, and the overall enrollment numbers for dually enrolled participants. In the analysis, however, we need to segment these groups into singly enrolled and dually enrolled participants, excluding SmartAC and SmartRate customers, so as to not double count estimated savings.

ANALYSIS METHODOLOGY

This section describes the analysis methodology for the evaluation of the CWP and Energy Alerts programs. It begins by summarizing the four main analysis improvements we made this year. Next, it describes the sample design process and the matching strategy used to match sample treatment customers to control customers. Finally, it describes the difference in differences method used to estimate the impacts of both programs.

3.1 SUMMARY OF ANALYSIS IMPROVEMENTS

For PY2013, we designed three different samples – one for single enrollment in CWP, another for single enrollment in Energy Alerts, and the last for dual participation. Each sample was segmented into subpopulations of interest. We focused on four aspects of the analysis that allowed us to incorporate interval data without sacrificing precision.

- **Sample stratification for relevant segments** – In subsets of the population where we have very large numbers of participants, but do not expect to see any savings based on findings from previous evaluations, we used samples that were stratified by energy use in order to reduce sample sizes. In stratifying based on monthly energy use we made the assumption that any energy savings that may be present and detectable would be correlated with energy use. This allowed us to reduce the variance of the estimates for the given sample sizes, thereby increasing precision for those segments while minimizing data sample sizes.
- **Census for other segments** – For another subset of the population segments, we analyzed all participants who passed the data screening process. By using a census of participants for these segments, we maximized the precision of the estimates.
- **Enhanced matching strategy** – We combined features of the improved matching strategy we developed for PY2012 with a two-stage matching process to decrease bias and increase the closeness of the match. For all control group pools we used the population of customers that has viewed the My Energy website, but has not participated in either CWP or Energy Alerts. This allows us to capture many of the similarities between the two groups such as access to the internet, higher level of engagement with the utility, and a desire to interact with the utility online. We first did a three-to-one match of control group to treatment group using twelve months of pretreatment billing data. We then did a one-to-one match based on pretreatment interval data. We added the second match using interval data to allow us to look at savings on an hourly level and detect differences in savings base on season, temperature, and time of day.
- **Revised analysis approach** – In previous evaluations we used a direct comparison of treatment and control customers to estimate savings impacts. This year we used a difference in differences approach to adjust the savings for preexisting differences between the control and treatment groups. We also conducted the analysis for eight day types (incorporating aspects of seasonality, temperature, and day of week) and then expanded the results to the monthly and yearly levels. For each day type, we developed savings estimates at the hourly level, differentiating for on-peak and off-peak hours.

3.2 SAMPLE DESIGN

We found that by using very large samples in the PY2012 evaluation, we were able to detect small impacts with the increased precision a large sample provides. This was particularly true at the program level and for some subpopulations; however, for other population segments some of the monthly savings impacts were not statistically significant. To continually improve the precision of our results, we once again selected large samples for the PY2013 analysis. In addition, we focused on techniques to optimize the sample sizes for the individual subpopulations of interest for each program to improve our ability to achieve statistically valid results within each subpopulation. As part of the optimization process, we stratified some population segments based on energy use to reduce the variance of the estimates while helping us keep the sample sizes manageable. Ideally, we would stratify based on estimated energy savings, but without those estimates at the segment level, we assumed energy use correlates with energy savings. For other subpopulations, we analyzed a census of participants, meaning that we included all participants who passed the data screening process. Using a census allowed us to maximize the precision of the results for those segments.

We designed three different samples – one for single enrollment in CWP, another for single enrollment in Energy Alerts, and the last for dual participation. We segmented each sample into several subpopulations of interest, and these correspond to subpopulations for which we have estimated impacts in past years:

- **Singly enrolled in CWP** (8 population segments)
  - Level of engagement measured by number of times the participant viewed their usage data online (1 view, 2-6 views, 7-15 views, 16+ views)
  - Continuing versus new user
- **Singly enrolled in Energy Alerts** (4 population segments)
  - Notification type (email, SMS text/phone)
  - Number of alerts during the year (5 or fewer, greater than 5)
- **Dual participation in both Energy Alerts and CWP** (32 population segments)
  - Notification type (email, SMS text/phone)
  - Number of alerts (5 or fewer, greater than 5)
  - Level of engagement (1 view, 2-6 views, 7-15 views, 16+ views)
  - Continuing versus new user

Since there are 32 population segments for dual participants, we only present dual participation results at the CWP or Energy Alerts level in this report. However, it was necessary for us to conduct the analysis at the segment level for proper weighting of the impacts.

The sample design process we followed includes the steps below:

- **Assign each participant to the appropriate segment** – This step consists of distributing the participants into the population segments defined above for each of the three samples. It also includes categorizing participants by enrollment period.
- **Apply restrictions and exclude data where necessary** – We apply nine types of restrictions to ensure we have sufficient data for the analysis and to exclude customers who also participated in other programs to avoid double counting the impacts. The restrictions are as follows:
  - Energy Alerts participants who un-enrolled before October 1, 2013
  - Participants that started (Energy Alerts enrollment date or CWP first visit) on or after October 1, 2013

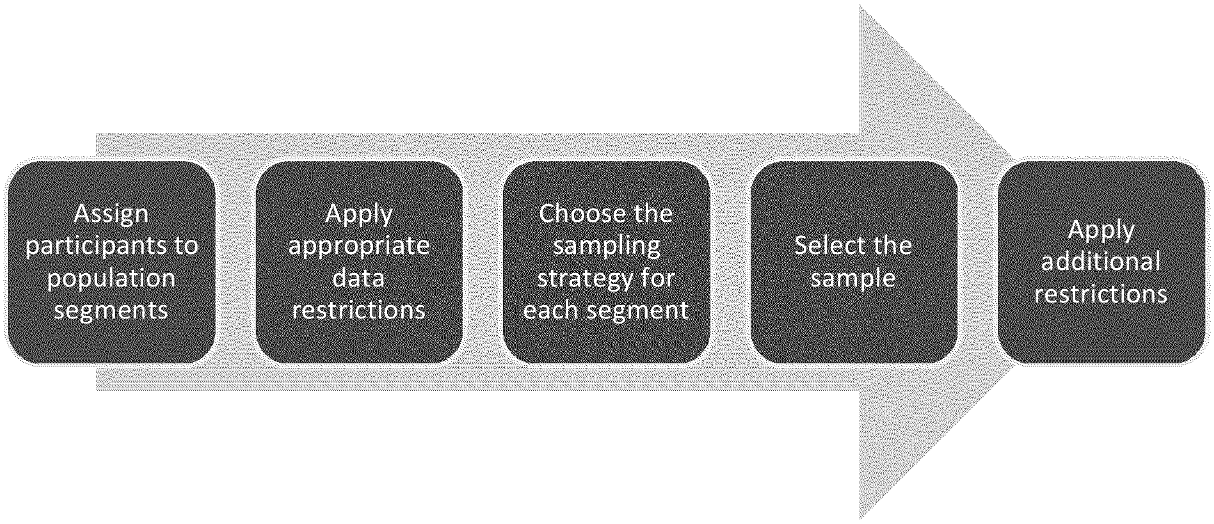
  - Participants who participated in SmartAC or SmartRate during the pretreatment period or 2013[13]
  - Participants without demographic data
  - Participants with billing data identified as problematic during our cleaning process
  - Participants without at least seven months of 2013 billing data
  - Participants without at least seven months (212 days) of 2013 interval data
  - Participants without nine months of pretreatment billing data
  - Participants without nine months (270 days) of pretreatment interval data
- **Choose the sampling strategy** - For each segment in each of the three samples, we decide which of the following two sampling strategies is most suitable based on our past evaluation results.
  - Use a census of participants in segments with smaller numbers of participants as well as in segments where we had statistically significant savings last year. By using all available and screened participants for these segments, we expect to improve or maintain the level of precision we achieved in previous evaluations.
  - Use a stratified sample for segments where we did not have statistically significant savings last year despite very large or census samples. Our repeated inability to detect savings in these groups despite the use of very large or census samples suggests that savings are, for all practical applications, zero for those subpopulations. Therefore, we altered our sampling approach to improve the relative precision for a given sample size, and allow us to reduce the sample size substantially in those subpopulations where we do not expect to see savings.
- **Select the sample** – For the sampled segments we apply the steps below to stratify sample.
  - Within each stratified segment, apply the Delanius-Hodges methodology to create three energy-based strata based on the most recent energy use data for current participants
  - Use Neyman allocation to optimally allocate sample points across the strata within each of these segments
- **Apply additional restrictions** – We apply two additional restrictions to the selected sample:
  - Exclusion of participants with interval data identified as problematic during our cleaning process
  - Removal of singly enrolled participants in the sample who first enrolled in Energy Alerts after May 31, 2013, so as to have at least a seven month treatment period for each customer. Removal of subset of dual participants with enrollment after May 31, 2012 because of data gap.

Figure 3-1 illustrates this sample design process. By going through these steps for each sample we were able to optimize the sample size used for the analysis, which is of considerable importance given the technical challenges of processing very high volumes of interval data for large samples. More importantly, this optimization process helps to ensure that even small

[13] We exclude participants that participated in SmartAC and SmartRate to avoid double counting of savings. When savings are estimated for the other programs, the savings attributable to CWP or Energy Alerts would be embedded in those estimates, if we count them again here, we would count the CWP or Energy Alerts savings for those customers twice.

savings, if present, would be detected with statistical significance at both the population level and within the desired subpopulations.

Figure 3-1 Illustration of Sample Design Process



The subsections below describe the sample design results for singly enrolled participants of CWP, singly enrolled participants of Energy Alerts, and dual participants of both CWP and Energy Alerts.

3.2.1 Singly Enrolled CWP Sample Design

We first segmented the CWP population into the eight subpopulations listed previously and applied the data restrictions. Table 3-1 shows the breakdown of the number of participants in the population that viewed their usage at least once in 2013, for each CWP population segment before applying the data restrictions.

Table 3-1 Singly Enrolled CWP Population Breakdown

Number of Visits	Participant Count (New)	Participant Count (Continuing)	Total Participants
1 visit	332,024	20,225	352,249
2 to 6 visits	234,234	26,603	260,837
7 to 15 visits	35,633	6,678	42,311
More than 15 visits	17,276	3,807	21,083
Total	**619,167**	**57,313**	**676,480**

Table 3-2 shows the effects of the two major sets of restrictions on the participant pool. In this case, the original participant pool consists of all singly enrolled CWP participants (i.e., they are not also enrolled in Energy Alerts) who viewed data at least once in 2013. Starting with a participant pool of 676,480, we removed customers participating in SmartRate or SmartAC as well as those without valid billing data to get to the restricted participant pool of 503,019. This number is what we base our weights on and is the population for which we are estimating savings impacts in Chapter 4. The billing data restriction is specific to singly enrolled CWP participants only, as that data was necessary in order to stratify the sample. In order to get at our sample pool, we needed an additional set of restrictions, shown below.

- Participants who first view their usage on or after October 1, 2013
- Participants without demographic data

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- Participants with billing data identified as problematic
- Participants with interval data identified as problematic

Following these restrictions, we ended up with a screened pool of 160,256 participants, from which we drew our sample.

Table 3-2 Effects of Restrictions on Singly Enrolled CWP Participant Pool

Restriction/Condition	CWP Population	% of Original Population
Original participant pool (those who viewed data at least once in 2013)	676,480	100%
Restricted participant pool (or restricted population)	503,019	74%
Sample pool	160,256	24%

Of the eight CWP population segments, we concluded that five would be best suited for energy usage-based stratification. For the remaining three, we determined it was necessary to use the entire population of screened participants. Table 3-3 shows the breakdown of the number of participants in the sample for each CWP population segment. The five cells in blue represent the segments sampled with energy usage -based stratification, while the white cells represent all screened participants. The original sa mple size before the applying the last two data restrictions was 13,307.

Table 3-3 Singly Enrolled CWP Sample Breakdown

Number of Visits	Participant Count (New)	Participant Count (Continuing)	Total Participants
1 visit	1,501	1,502	3,003
2 to 6 visits	1,501	1,502	3,003
7 to 15 visits	3,001	1,231	4,232
More than 15 visits	2,451	618	3,069
Total	**8,454**	**4,853**	**13,307**

After carrying out the final two data restrictions on the sample of participants in Table 3-3, we ended up with a total participant sample of 13,019 singly enrolled CWP customers. Table 3-4 shows the additional restrictions and Table 3-5 shows the final sample breakdown by population segment.

Table 3-4 Effects of Additional Restrictions on Singly Enrolled CWP Sample

Restriction/Condition	CWP Sample	% of Original Population
Original sample size	13,307	1.97%
Exclusion of participants with interval data identified as problematic during our cleaning process	13,019	1.92%
Energy Alerts and dual participation enrollment restrictions *(this does not affect the CWP sample)*	13,019	1.92%

Table 3-5 Singly Enrolled CWP Sample Breakdown – Final Count

Number of Visits	Participant Count (New)	Participant Count (Continuing)	Total Participants
1 visit	1,478	1,481	2,959
2 to 6 visits	1,468	1,484	2,952
7 to 15 visits	2,923	1,215	4,138
More than 15 visits	2,363	607	2,970
Total	**8,232**	**4,787**	**13,019**

3.2.2 Singly Enrolled Energy Alerts Sample Design

PG&E provided enrollment and alert notification data for every customer who was enrolled in the Energy Alerts program as of December 31, 2013. We first segmented the Energy Alerts population into the four subpopulations defined previously and applied the data restrictions. Table 3-6 shows the breakdown of the number of participants in the population for each energy Alerts population segment before applying the data restrictions.

Table 3-6 Singly Enrolled Energy Alerts Sample Breakdown

Number of Alerts	Participant Count (E-mail)	Participant Count (SMS)	Total Participants
5 or less	5,592	3,073	8,665
More than 5	14,878	8,074	22,952
Total	**20,470**	**11,147**	**31,617**

Table 3-7 shows the effects of the two major sets of restrictions on the participant pool. In this case, the original participant pool consists of all singly enrolled Energy Alerts participants (i.e., they are not also enrolled in CWP) who received at least one alert in 2013. In total, roughly 42,000 customers were singly enrolled in the program during 2013. Of those participants, about three-fourths (31,617) received at least one alert during 2013. We assume that participants who signed up for Energy Alerts but did not receive any alerts are very unlikely to save any energy due to enrollment in the program. Of the participants who received at least one alert during the program year, 26,415, about 84%, remained after we removed customers participating in SmartRate or SmartAC as well as those who started participating on or after June 2013. In addition to having limited analysis data for these customers in the treatment period, we believe we cannot accurately assign them to a proper segment. For example, if a customer started participating in November 2013 and received two alerts through the end of the year, we don't know how many more alerts they would have received had they started participating earlier. We use this restriction for singly enrolled Energy Alerts participants only. Following this, the second set of restrictions, listed above in the CWP section, left us with 9,422 customers, about 30% of our original participant pool. This made up the singly enrolled Energy Alerts sample.

Table 3-7 Effects of Restrictions on Singly Enrolled Energy Alerts Participant Pool

Restriction/Condition	Energy Alerts Population	% of Original Population
Original participant pool (those who received at least one alert in 2013)	31,617	100%
Restricted participant pool	26,415	84%
Sample pool	9,422	30%

For all four Energy Alerts population segments, we concluded that it was necessary to use the entire population of screened participants. Table 3-8 shows the breakdown of the number of participants in the sample for each Energy Alerts population segment. The original sample size before the applying the last two data restrictions was 9,422 singly enrolled Energy Alerts customers.

Table 3-8 Singly Enrolled Energy Alerts Sample Breakdown

Number of Alerts	Participant Count (E-mail)	Participant Count (SMS)	Total Participants
5 or less	1,018	500	1,518
More than 5	5,135	2,769	7,904
Total	**6,153**	**3,269**	**9,422**

After carrying out the final two data restrictions on the sample of participants in Table 3-8, we ended up with a total participant sample of 9,152 singly enrolled Energy Alerts customers. Table 3-9 shows the additional restrictions and Table 3-10 shows the final sample breakdown by population segment.

Table 3-9 Effects of Additional Restrictions on Singly Enrolled Energy Alerts Sample

Restriction/Condition	Energy Alerts Sample	% of Original Population
Original sample size	9,422	30%
Exclusion of participants with interval data identified as problematic during our cleaning process	9,152	29%
Energy Alerts and dual participation enrollment restrictions	9,152	29%

Table 3-10 Singly Enrolled Energy Alerts Sample Breakdown – Final Count

Number of Alerts	Participant Count (E-mail)	Participant Count (SMS)	Total Participants
5 or less	958	451	1,409
More than 5	5,039	2,704	7,743
Total	**5,997**	**3,155**	**9,152**

3.2.3 Dual Participation Sample Design

For the dual participation sample, we first segmented the population into the 32 subpopulations defined previously and applied the data restrictions. Table 3-11 shows the effects of the two major sets of restrictions on the participant pool. In this case, the original participant pool consists of all dually enrolled Energy Alerts and CWP participants who received at least one alert and viewed their online usage data at least once in 2013. Starting with a participant pool of 42,845, we removed customers participating in SmartRate and Smart AC to get to the restricted participant pool of 36,509. The second set of restrictions, listed above in the CWP section, left us with 6,309 customers, about 14% of our original participant pool. This made up the dually enrolled participant sample.

Table 3-11 Effects of Restrictions on Dual Participation Participant Pool

Restriction/Condition	Dual Participation Population	% of Original Population
Original participant pool (those who received at least one alert and viewed data at least once in 2013)	42,845	100%
Restricted participant pool	36,509	85%
Sample pool	6,309	15%

For all 32 Dual Participation population segments, we concluded that it was necessary to use the entire population of screened participants. Table 3-12 shows the final sample breakdown by population segment.

Table 3-12 Dual Participation Sample Breakdown – Final Count

Number of Alerts	Number of Visits	New Participant Count (E-mail)	New Participant Count (SMS)	Continuing Participant Count (E-mail)	Continuing Participant Count (SMS)	Total Participants
5 or less	1 visit	174	65	85	41	365
	2 to 6 visits	257	90	162	66	575
	7 to 15 visits	49	20	46	11	126
	More than 15 visits	27	5	29	8	69
More than 5	1 visit	712	391	565	289	1,957
	2 to 6 visits	836	463	730	416	2,445
	7 to 15 visits	144	69	175	81	469
	More than 15 visits	66	41	148	48	303
Total		**2,265**	**1,144**	**1,940**	**960**	**6,309**

3.3 CREATING THE MATCHED CONTROL GROUPS

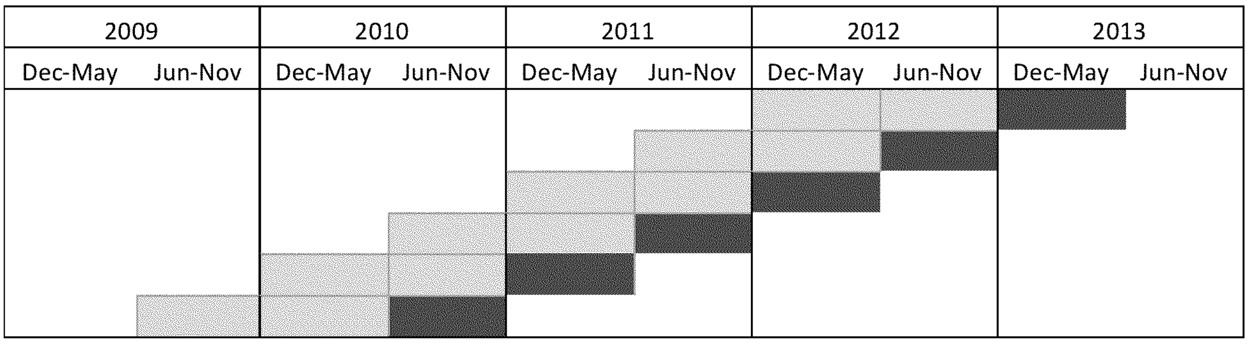
As we have done in past evaluation years, we estimated the energy savings associated with these programs by comparing energy use of participating customers with a carefully selected control group of non-participating customers who are also My Energy users. To do this, we used a stratified matching technique to construct a control group that is very similar to the participant group in all observable ways, except for being exposed to the program treatment.

In a pilot setting it is often possible to use an experimental design with randomized assignment to treatment and control groups to control for self-selection bias. Self-selection bias is the presence of systematic differences between customers who volunteer for a program or treatment and those who do not. Self-selection bias is problematic because the estimates of savings cannot be separated from the systematic differences between treatment and control customers. Matching participants to the control group can help eliminate bias for any observable characteristic. Using only those customers who have accessed My Energy for the control group also helps reduce bias, since this captures some of the unobservable characteristics of online users. However, because we cannot fully duplicate the results of a designed experiment through matching, the matches will necessarily have some level of bias, and the estimates will also have some level of uncertainty.

After our PY2011 analysis, we identified two potential sources of bias in the match. We took measures to reduce those sources of bias in our PY2012 analysis and now again in our PY2013 analysis[14]. For the PY2013 matching process, we employed the modified Euclidean distance metric approach we used in PY2012 to create the matched control groups. We found that the optimal matching method uses less restrictive filters, so we create buckets only by dwelling type (i.e., single and multifamily) and by climate zone (coastal and inland as determined by CEC weather zone). The less restrictive buckets capture only high level demographic characteristics, but have the added benefit of allowing us to more closely match on energy. In addition, a better match is possible due to there being more control group pool customers for each participant to match with. This is not due to the total size of the control group pool, but to the size of each grouping "bucket." If, for example, we have 100 participants and 1,000 customers in the control group pool, each participant would have more potential matches in a one-bucket grouping (1,000) than in a two-bucket grouping (500).

Both CWP and Energy Alerts are fully deployed programs in which participants can enroll or un-enroll freely. This means that pretreatment periods are customer specific. In order to avoid creating too many groups based on enrollment, we created distinct enrollment windows like we did in PY2012. Based on this segmentation, pretreatment periods were defined as the 12 months before the start of the enrollment window. To keep summer months together, we split years into two six-month blocks, from December to May and from June to November, where all months but December belonged to the same year. Figure 3-2 below shows the enrollment windows in dark blue and their associated pretreatment periods in light blue for Energy Alerts.

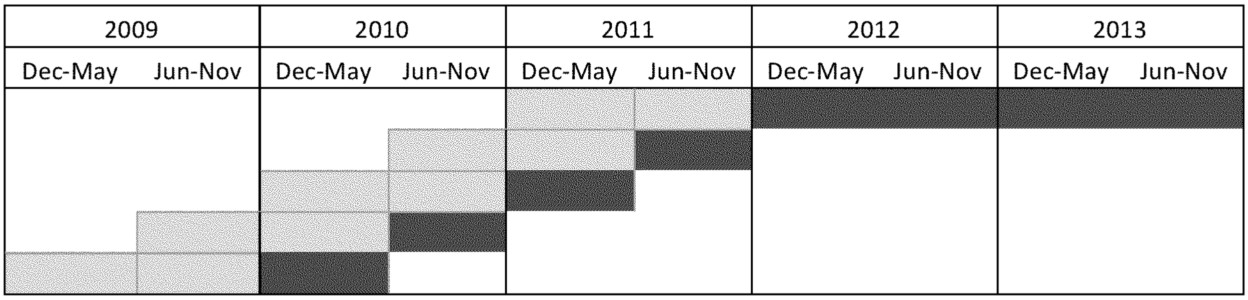
Figure 3-2 Enrollment Windows (Dark Blue) and Associated Pretreatment Periods (Light Blue) for Singly Enrolled Energy Alerts



For the CWP program, establishing the enrollment windows was less straightforward because of the data gap in 2012 participation. For CWP, we have information on 2013 participation and participation from 2008-2011, but we do not have information on 2012 participation. Therefore, we had to categorize participants from 2013 as either "new" which will mean that they began participating in the program any time during 2012 or 2013, or "continuing" meaning that their first access was in the 2008-2011 timeframe. We also needed to create our pretreatment windows to accommodate the data gap, meaning that any of the participants classified as "new" have a pretreatment window of 1/2011 – 12/2011, while continuing participants have a pretreatment window assigned in the traditional method. Figure 3-3 below shows the enrollment windows and associated pretreatment periods for CWP.

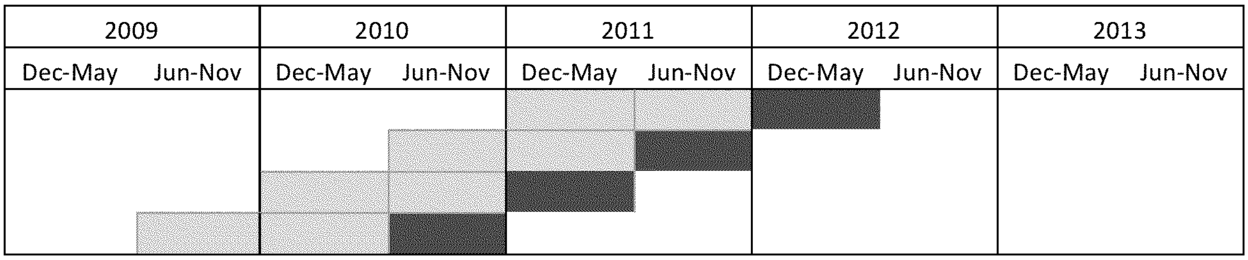
[14] One potential source of bias was seasonal weighting, so we created an unweighted distance metric to diminish its effects. Another potential source was related to differences in the availability of pretreatment interval for control group customers and participants, so we modified our approach and requested and included more pretreatment data in the analysis.

Figure 3-3 Enrollment Windows (Dark Blue) and Associated Pretreatment Periods (Light Blue) for Singly Enrolled CWP



Similarly, Figure 3-4 shows the enrollment periods and associated pre treatment periods for Dual Participation.

Figure 3-4 Enrollment Windows (Dark Blue) and Associated Pretreatment Periods (Light Blue) for Dual Participation

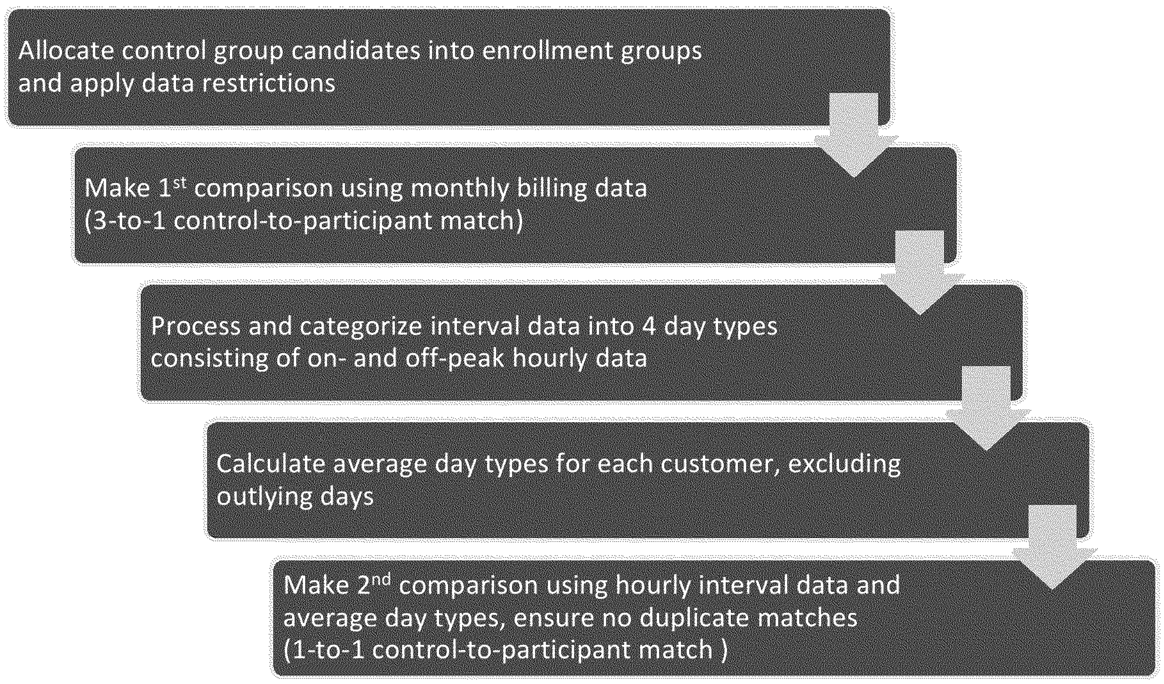


Once we assigned the participants to an enrollment window and pre treatment period, we followed the process below to create the matched control groups for each of the three samples (see Figure 3-5):

- **Allocate control group candidates to each enrollment group** – In this step, we assign each of the candidates to the appropriate enrollment group in Figure 3-2 through Figure 3-4.
- **Apply data restrictions** – Restrictions consist of excluding participants of SmartRate or SmartAC and excluding those lacking demographic data or adequate pretreatment data .
- **Make the first comparison ba sed on calendarized monthly pre treatment energy** – Within each enrollment group and using the Euclidean distance formula , compare the monthly billing data of each participant to every control group candidate who shares the same demographic characteristics —dwelling type (singe family versus multi -family) and climate zone (coastal versus inland) .
- **Create three -to-one match** – For every participant, select three control customer matches based on the pairing s that yield the minimum distance value, signaling that they are the most similar .
- **Request pre treatment interval data** – By first doing the match based on billing data, we reduce the volume of interval data needed for the final match, which is based on pretreatment interval data .
- **Create hourly data** – Aggregate the 15-minute data to hourly by averaging kW values in groups of four .
- **Categorize into the four matching day types** (see below) – This step also involves cleaning the data to correct for duplicate records and to exclude days with zero, missing, or negative valu es in an hour .

  - Summer Weekday: May-October
  - Summer Weekend: May -October
  - Winter Weekday: November -April
  - Winter Weekend: November -April
- **Aggregate hours for each day type into on -peak and off -peak periods** – The on-peak period is defined as noon to 6 PM.
- **Identify outlier days and excessive zeroes** – Outlying days for a given customer includes those with considerable spikes or sags relative to the average . Excessive zeroes include consecutive zeroes of more than five 15 minute intervals.
- **Calculate average day types by customer** – The average day types e xclude the outliers.
- **Create one-to-one match** – Run the matching algorithm to create a one-to-one comparison of treatment and control customers based on the pretreatment interval data for the average day types.
- **Prevent overlap** – Ensure that control group customers are not matched with more than one participant within a given sample .

Figure 3-5 Illustration of Matching Process



3.4 POTENTIAL SAMPLE BIAS

Imposing any type of limitation on a sample can introduce bias. In this case, because we limited the sample to participants with adequate historical data we may have introduced bias. By limiting the treatment group to customers who maintain the same residence, we are m ore likely to select single family homes or long term renters. These types of customers may be likely to make changes in energy use that require investment in their property and are therefore may be more likely to act on information provided to them about their usage. They may also be more likely to use more energy.

It is not possible to estimate the level of bias introduced into the sample due to these restrictions directly, but it is possible to get a sense of how much bias might be present by comparing the characteristics of the participants selected for analysis and those that were excluded.[15]

3.4.1 Singly Enrolled Customer Web Presentment Potential Bias

Table 3-13 presents a comparison of the percentage of CWP participants with various demographic characteristics between the overall participant population and the restricted participant population.

Table 3-13 Comparison of Population to Restricted Population – Singly Enrolled CWP

Characteristic	CWP Population	Restricted Population
CARE	17.6%	14.0%
Non-CARE	82.4%	86.0%
Coastal	57.1%	39.5%
Inland	42.9%	60.5%
Single Family	73.8%	89.7%
Multifamily	26.2%	10.3%

As we might expect, by restricting the participants to those with complete billing data, thereby capturing those that remain in the same residence longer, we see lower percentages of both CARE and multifamily customers in the restricted population. This means that these two groups are underrepresented in our sample. Coastal customers are also underrepresented. However, because the sample is weighted based on the distribution of participants in the population, we will accurately reflect the savings for those multifamily, CARE, and coastal customers we are able to analyze.

It can also be useful to examine the relationship between key population segments and demographic characteristics. In Table 3-14 below, we show the percentage of customers with different characteristics by number of My Usage views. When we compare the number of participants by segment with each characteristic, we can see that the number of times a participant views the website is not highly correlated with their CARE status, weather zone, or dwelling type. (For example, 24.5% of all CARE participants and 22.5% of non-CARE participants only viewed the My Usage webpage one time during 2013.) This supports the conclusion that CWP energy savings are not correlated with the characteristics we could compare here; therefore, excluding more CARE, coastal, and multifamily participants is unlikely to introduce a significant bias.

[15] In this case we excluded participants due to a lack of data and in order to measure the bias we would need to obtain the exact data that was the basis of the exclusion. Therefore, in this case especially, it is extremely difficult to know how different the excluded customers energy or savings is from those who were included in the analysis.

Table 3-14 Correlation Between Views and Demographic Characteristics – Singly Enrolled CWP

Characteristic	One View	2-6 Views	7-15 Views	16+ views
CARE	24.5%	25.0%	30.4%	20.1%
Non-CARE	22.5%	22.3%	32.0%	23.2%
Coastal	23.0%	21.2%	32.5%	23.3%
Inland	22.6%	23.6%	31.3%	22.5%
Single Family	22.8%	23.0%	31.7%	22.5%
Multifamily	22.5%	20.2%	32.7%	24.6%

We were also interested in comparing rate and weather station information between treatment and control group customers. Table 3-15 shows the count and associated percentage of singly enrolled CWP participants as well as their matched control group in each rate category. These are the participants used in the analysis and correspond to the grand total of 13,019 in Table 3-5 above. We defined TOU as customers on either HE6, HE7, or HEVA and standard as everything else. In our sample, there were no customers on the traditional TOU rate, E-6. The overwhelming majority (99%) of singly enrolled CWP customers are on the standard rate and are balanced between treatment and control. The treatment and control TOU counts are also similar, but because of the small number of customers, the percentages are impacted more.

Table 3-15 Comparison of Standard and TOU rates – Singly Enrolled CWP

Rate	Control Group	Treatment Group
Standard	12,933	12,911
	50.04%	49.96%
TOU	86	108
	44.33%	55.67%
Total	13,019	13,019

The distribution of treatment and control group customers in each weather station was well balanced. Because singly enrolled CWP customers come from 24 distinct weather stations, we do not include the table in the body of the report. In general, the fewer number of total customers, the worse the percentage comparisons are. This seems to be correlated with population as well. For the top 18 weather stations with the most customers, equality was off by just over three percentage points. The Concord weather station was the most well balanced with 1,248 (49.86%) control group customers to 1,255 (50.14%) treatment customers. Ukiah was the worst balanced with 3 of its 19 customers being in the control group and the remaining 16 in the treatment group.

3.4.2 Singly Enrolled Energy Alerts Potential Bias

Table 3-16 presents a comparison of the percentage of Energy Alerts participants with various demographic characteristics between the overall participant population and the restricted participant population.

Table 3-16 Comparison of Population to Restricted Population – Singly Enrolled Energy Alerts

Characteristic	Energy Alerts Population	Restricted Population
CARE	18.4%	16.9%
Non-CARE	81.6%	83.1%
Coastal	45.8%	42.4%
Inland	54.2%	57.6%
Single Family	87.0%	89.5%
Multifamily	13.0%	10.5%

Similar to what we saw in the CWP program, by restricting the participants to those with complete billing data, thereby capturing those that remain in the same residence longer, we see slightly lower percentages of CARE , coastal, and multifamily customers in the restricted population. This means that these t hree groups are underrepresented by a small amount in our sample. We used weighting to ensure that we will accurately reflect the savings for those multifamily and CARE customers we are able to analyze.

In Table 3-17 below, we show the percentage of custom ers with different characteristics by number of alerts. When we compare the number of participants by segment within each characteristic, we can see because the number of alerts is highly correlated with a customer's energy consumption, substantially more multifamily participants (38.6%) receive five or fewer alerts annually in comparison to single family participants (12.3%). This is also true to a lesser extent for coastal (19.6%) versus inland (11.7%) participants. The results we see below are in line with what we would expect to see based on our stratification. Those customers that receive fewer alerts are necessarily lower usage customers, and are therefore also more likely to be multi-family and/or coastal (lower cooling load) customers. Therefore, t hese correlations are unlikely to indicate any sample bias and are in fact a side effect of the stratification that was used which will affect all the customers in the population equally.

Table 3-17 Correlation Between Views and Demographic Characteristics – Singly Enrolled Energy Alerts

Characteristic	5 or fewer Alerts	More than 5 alerts
CARE	17.0%	83.0%
Non-CARE	14.6%	85.4%
Coastal	19.6%	80.4%
Inland	11.7%	88.3%
Single Family	12.3%	87.7%
Multifamily	38.6%	61.4%

For singly enrolled Energy Alerts participants as well as their matched control group, we show the count and associated percentage in each rate category in Table 3-18 below. These are the participants used in the analysis and correspond to the grand total of 9,152 in Table 3-10 above. We use the same TOU and standard rate definitions outlined above. The overwhelming majority (99%) of singly enrolled Energy Alerts customers is on the standard rate and is balanced between treatment and control. The treatment and control TOU counts are also si milar, but because of the small number of customers, the percentages are impacted more.

Table 3-18 Comparison of Standard and TOU rates – Singly Enrolled Energy Alerts

Rate	Control Group	Treatment Group
Standard	9,110	9,090
	50.05%	49.95%
TOU	42	62
	40.38%	59.62%
Total	9,152	9,152

The distribution of treatment and control group customers in each weather station was well balanced. Because singly enrolled Energy Alerts customers come from 25 distinct weather stations, we do not include the table in the body of the report. In general, the fewer number of total customers, the worse the percentage comparisons are. This seems to be correlated with population as well. For the top 18 weather stations with the most customers, equality was off by just less than three percentage points. The Cup ertino weather station was the most well balanced with 412 (50.24%) control group customers to 408 (49.76%) treatment customers. Paso Robles was the worst balanced with 8 of its 28 customers being in the control group and the remaining 20 in the treatment group.

3.4.3 Dual Participation Potential Bias

Table 3-19 presents a comparison of the percentage of dual participants with various demographic characteristics between the overall participant population and the restricted participant population.

Table 3-19 Comparison of Population to Restricted Population – Dually Enrolled Energy Alerts

Characteristic	Energy Alerts Population	Restricted Population
CARE	15.9%	15.3%
Non-CARE	84.1%	84.7%
Coastal	44.9%	37.8%
Inland	55.1%	62.2%
Single Family	87.4%	91.1%
Multifamily	12.6%	8.9%

For dual participants, we see lower percentages of coastal and multifamily customers in the restricted population , but the percentage of CAR E customers is very close to the original population . Once again, we used weighting to ensure that we will accurately reflect the savings for those coastal and multifamily customers we are able to analyze.

In Table 3-20 and Table 3-21, we show the percentage of customers with different characteristics by CWP viewing stratum and by Energy Alerts stratum. Similar to the singly enrolled CWP participa nts, when we compare the number of participants by segment with each characteristic, we can see that the number of times a participant views the website is not highly correlated with their CARE status , weather zone, or dwelling type. This suggests that und er-representing the coastal and multifamily participants i s unlikely to introduce a significant bias.

Table 3-20 Dual Participation Correlation Between Views and Demographic Characteristics – Five or Fewer Alerts

Characteristic	One View	2-6 Views	7-15 Views	16+ views
CARE	38.8%	44.8%	12.0%	4.4%
Non-CARE	29.9%	52.5%	11.2%	6.4%
Coastal	33.5%	52.5%	10.2%	3.8%
Inland	29.4%	50.1%	12.4%	8.1%
Single Family	30.2%	51.2%	11.8%	6.8%
Multifamily	35.6%	51.5%	9.6%	3.4%

Table 3-21 Dual Participation Correlation Between Views and Demographic Characteristics – More than Five Alerts

Characteristic	One View	2-6 Views	7-15 Views	16+ views
CARE	39.2%	45.4%	9.3%	6.1%
Non-CARE	37.4%	47.9%	8.9%	5.8%
Coastal	40.3%	45.7%	8.7%	5.3%
Inland	36.3%	48.5%	9.1%	6.2%
Single Family	37.8%	47.4%	8.8%	5.9%
Multifamily	35.9%	48.2%	11.0%	4.9%

Table 3-22 shows the count and associated percentage of dually participants as well as their matched control group in each rate category. These are the participants used in the analysis and correspond t o the grand total of 6,309 in Table 3-12 above. We use the same TOU and standard rate definitions outlined above. In our sample, there were no customers on the tradit ional TOU rate, E-6. The overwhelming majority (99%) of singly enrolled CWP customers is on the standard rate and is balanced between treatment and control. The treatment and control TOU counts are also similar, but because of the small number of customers , the percentages are impacted more.

Table 3-22 Comparison of Standard and TOU rates – Dually enrolled

Rate	Control Group	Treatment Group
Standard	6,283	6,258
	50.10%	49.90%
TOU	26	51
	33.77%	66.23%
Total	6,309	6,309

The distribution of treatment and control group customers in each weather station was well balanced. Because dually customers come from 23 distinct weather stations, we do not include the table in the body of the report. In general, the fewer number of tot al customers, the worse the percentage comparisons are. This seems to be correlated with population as well. For the top 18 weather stations with the most customers, equality was off by just over three and a half percentage points. Of the weather stations with a substantial number of customers, Sacramento was the most well balanced with 482 (50.21%) control group customers to 478 (49.79%) treatment customers. Paso Robles, which only had 20 customers , was perfectly balanced. Santa

Maria was the worst balanced with 2 of its 7 customers being in the control group and the remaining 5 in the treatment group.

3.5 ESTIMATING ENERGY SAVINGS

The primary goal of the impact analysis is to estimate total annual and average monthly savings per customer for each program. This year's analysis incorporates a difference in differences method to estimate the savings instead of the direct comparison approach we used in past years. In addition, this year we created eight average day types with on-peak and off-peak hours and analyzed the impacts using hourly interval data for each of those day types. Once we had the results by day type for each customer, we were able to expand the results into annual and monthly savings for each program, as well as for each population segment within each program.

3.5.1 Definition of Analysis Day Types

We used eight day types for the impact analysis. The bullet points below define the day types and describe their derivation:

- **Hot summer weekday** – Defined as an average of days in the pre and post-treatment period on which the average temperature exceeded the 85th percentile during the 2013 summer for a customer's representative weather station.[16] This generally resulted in between 8 and 12 "hot summer weekdays."
- **Typical summer weekday** – Defined as an average of days in the pre and post-treatment period on which the average temperature fell between the 15th and 85th percentile during the 2013 summer for a customer's representative weather station.
- **Cool summer weekday** – Defined as an average of days in the pre and post-treatment period on which the average temperature fell below the 15th percentile during the 2013 summer for a customer's representative weather station. This generally resulted in between 8 and 12 "cold summer weekdays."
- **Summer weekend** – Defined as an average of all summer weekends.
- **Warm winter weekday** – Defined as an average of days in the pre and post-treatment period on which the average temperature exceeded the 85th percentile during the 2013 winter for a customer's representative weather station. This generally resulted in between 8 and 12 "warm winter weekdays."
- **Typical winter weekday** – Defined as an average of days in the pre and post-treatment period on which the average temperature fell between the 15th and 85th percentile during the 2013 winter for a customer's representative weather station.
- **Cold winter weekday** – Defined as an average of days in the pre and post-treatment period on which the average temperature fell below the 15th percentile during the 2013 winter for a customer's representative weather station. This generally resulted in between 8 and 12 "cold winter weekdays."
- **Winter weekend** – Defined as an average of all winter weekends.

3.5.2 Difference in Differences Method

The difference in differences method compares hourly load shapes of participating customers with a control group of similar, but non-participating customers, both during the participation period (treatment period) and for a time before participation started (pretreatment period). Comparison during the treatment period gives an unadjusted estimate of the impacts. This estimate is then corrected using the difference during the pretreatment period to adjust for any preexisting differences between the participant and control groups. Therefore, the difference in differences method provides a robust savings estimation that is particularly useful for situations

[16] Each customer was mapped to either a coastal or inland weather station based on their geographical location.

where there may be preexisting differences between the participants and the customers in the control group.

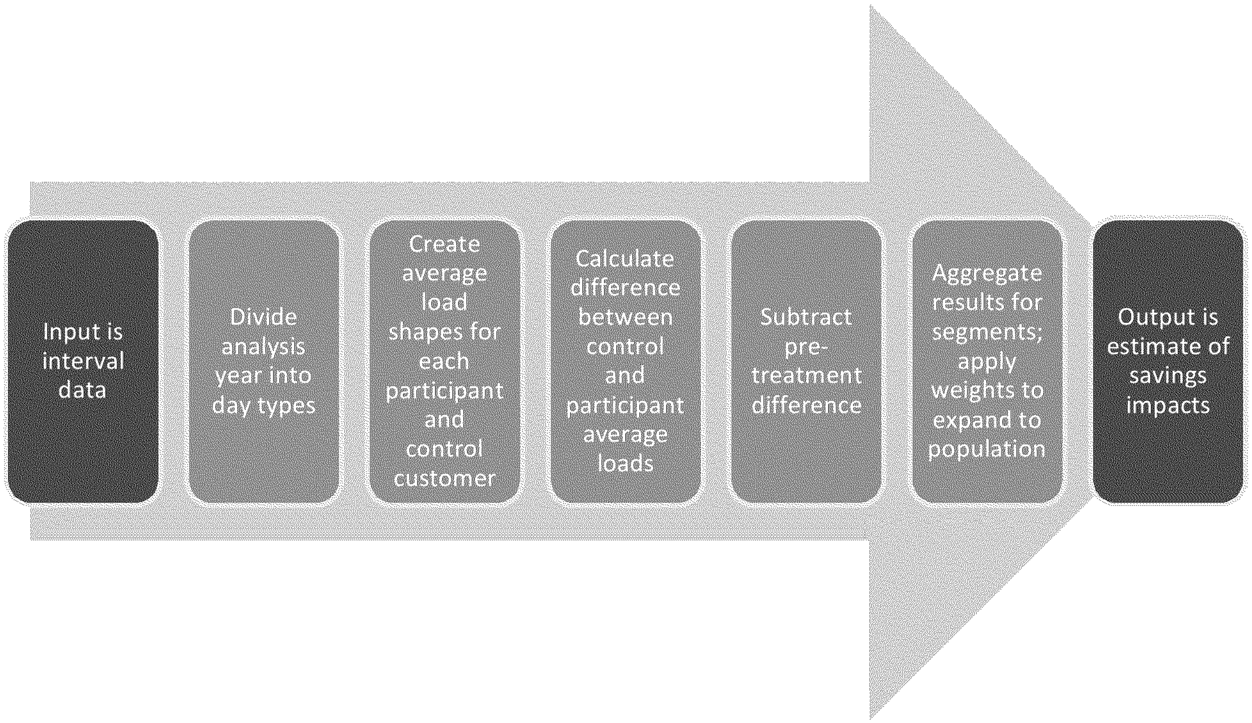
The difference in differences method consists of the following steps for each of the three samples (Figure 3-6 illustrates the approach):

- **Input is interval data** – Start with hourly interval data for the treatment and pretreatment periods for participating customers and a control group.
- **Divide the analysis year into day types** – Create eight average day types for each customer in the study for the pretreatment and treatment periods.[17]
- **Create average load shapes** – For each participant and matched control group customer, calculate the average load shape for each day type during the pretreatment and treatment periods. Then, average the load shapes across all customers for both the pretreatment and treatment periods.
- **Calculate first difference** – For each population segment, calculate the difference between the control group's average load and the participant group's average load for each day type, in the treatment period and in the pretreatment period. The result of the difference during the treatment period is the first difference, which represents the unadjusted impact.
- **Calculate second difference** – The result of the difference during the pretreatment period is the pretreatment difference. Subtract pretreatment difference for each day type from the unadjusted impact to get the adjusted or corrected impact for each population segment. This second difference represents the estimated savings impacts for each day type corrected for the pre-participation differences between the treatment and control groups.
- **Estimate impacts for sub populations** – Aggregate the results for each population segment to determine average monthly and annual impacts. We do this by first determining the average impacts for each day type. Then, we multiply the number of days of each day type in a month (or year) by the average impact estimates for the given day type. For example, if a month has 20 summer weekdays and 10 summer weekends, we would multiply the summer weekday impacts by 20 and the summer weekend impacts by 10 to estimate the impacts for the month.
- **Estimate program-level impacts for the population** – Apply the appropriate weights to the population segment results to expand them to the entire population.
- **Determine statistical significance** – Create 95% confidence intervals around the savings estimates. If we determine that the difference in consumption is statistically significant, this indicates that we can be 95% certain that the actual savings value for the subpopulation or population falls within the confidence interval and is not equal to zero.

As shown previously in Figure 3-2 through Figure 3-4, there are customers who start participating well into the analysis period. We account for this by only including data for participants and their control group matches for the time after enrollment. This ensures that we only analyze the period during which participants are exposed to the treatment.

[17] Note that to use the difference in differences approach to calculate daily savings we must carefully define the days that are used to calculate the pre-treatment difference. We would not want to use the same date in the previous year to calculate our pretreatment difference. For example, usage on June 6, 2012 may not be a comparable day for usage on June 6, 2013 because of differences in the day of the week and weather. Therefore, we average several days in the same month of the previous year, taking into account both weather and day type to create the days we use to calculate our pretreatment differences.

Figure 3-6 Difference in Differences Process



Equation 1 shows a simplified form of the mathematical calculations used in the difference in differences analysis to estimate energy savings for each day type.

$$Savings = (Cntl_{after} - Tx_{after}) - (Cntl_{before} - Tx_{before}) \quad (1)$$

Where

$Cntl_{after}$ is the average control group customer energy use in the treatment (after) period

Tx_{after} is the average participant group (also referred to as the treatment group) customer energy use in the treatment (after) period

$Cntl_{before}$ is the average control group customer energy use in the pretreatment (before) period

Tx_{before} is the average participant group customer energy use in the pretreatment (before) period

This equation can easily be rewritten as the following, which allows for comparison of the actual participant group load in the analysis period with an adjusted treatment period control group. This is the way data is displayed on the load profile graphs in this report. Visually, this depicts the savings as the difference between the two lines, in comparison with the actual participant group load shape.

$$Savings = [Cntl_{after} - (Cntl_{before} - Tx_{before})] - Tx_{after} \quad (2)$$

The term in the square brackets is the adjusted control group load, and the final term is the actual participant group load during the analysis period.

3.5.3 Accounting for Dual Participation

When we estimate the savings for each program, it is important to account for dual participation. We do this by estimating the savings in two pieces: first, for the singly enrolled participants, and second, for the dually enrolled participants. The savings estimates for the singly enrolled participants represent the impacts from the treatment program only, while the savings estimates from the dually enrolled participants tell us what the additional, or incremental, savings attributable to the second program are for the dually enrolled treatment customers. It is important to note that the estimate of savings for the secondary program is indicative of savings only for dually enrolled customers, since we cannot be sure if their participation in the first program influences their savings from the second program and vice-versa.

3.5.4 Participation Counts used in Program-Level Impacts

Table 3-23 shows how we reduced the original participant pools for singly and dually enrolled CWP and Energy Alerts participants when we estimated impacts at the program level. The participant counts we used in the program-level analysis exclude SmartRate and SmartAC customers. In addition, for singly enrolled CWP participants, we exclude customers without valid billing data because that data was necessary in order to stratify the sample. For singly enrolled Energy Alerts participants, we also removed those who started participating on or after June 2013. In addition to having limited analysis period data for these customers, we believe we cannot accurately assign these customers to a proper segment. We elaborate on this in section 3.2.2. The numbers below represent the customers and the population for which we try and estimate savings. From this point, as shown in Table 3-2, Table 3-7, and Table 3-11, we remove customers without valid billing or interval data, without demographic data, or who first viewed their usage on or after October 1, 2013. These restrictions are used in order to facilitate the analysis. For example, because we match customers based on geography and dwelling type, we cannot match and, therefore, analyze a customer without this crucial demographic data.

Table 3-23 Participation Counts used in Program-Level Impacts

	CWP		Energy Alerts	
	Number of Participants in Population	Number of Participants in Program-Level Analysis	Number of Participants in Population	Number of Participants in Program-Level Analysis
Singly Enrolled Participants	676,480	503,019	31,617	26,415
Dually Enrolled Participants	42,845	36,509	42,845	36,509
Total	**719,325**	**539,528**	**74,462**	**62,924**

IMPACT RESULTS

We estimated savings for singly enrolled CWP participants, singly enrolled Energy Alerts participants, and dual participants participating in both CWP and Energy Alerts. First we provide the matching results and then we present the energy impacts for single participation in each program and dual participation. The dual participation results tell us the incremental effect of participating in both programs on the impacts for CWP and Energy Alerts.

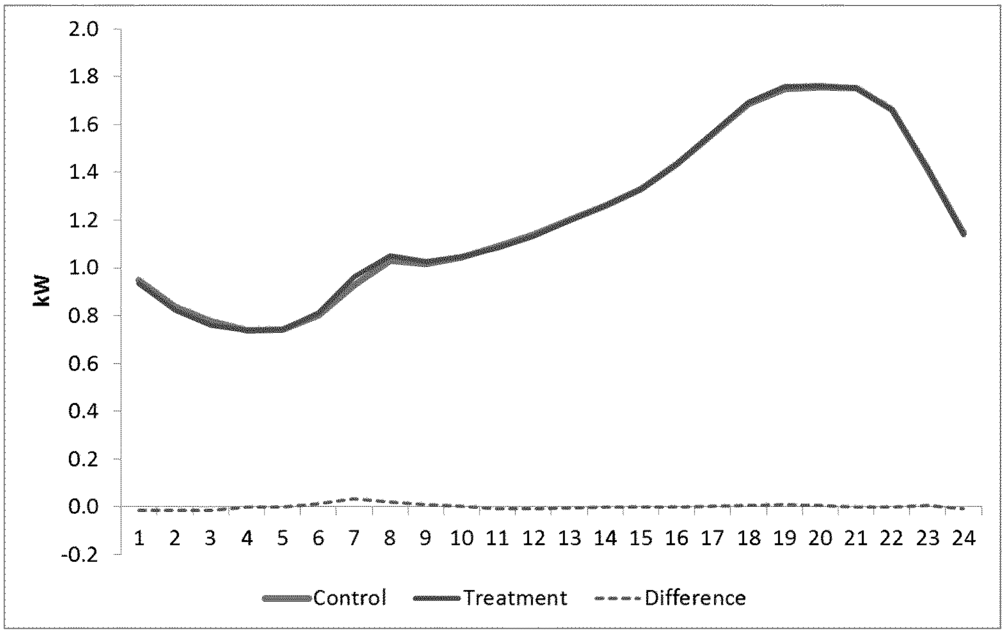
4.1 MATCHING RESULTS

Before estimating the savings, it is important to check the quality of the match between the treatment and control customers. We do this by plotting average hourly pretreatment energy use of the treatment and control customers on the same graph and comparing the load shapes for each day type in each enrollment window. We used four matching day types using season and day of the week—summer weekday, winter weekday, summer weekend, and winter weekend. Summer is defined as the months May through October. Comparing usage gives us a good idea of how well customers are matched. However, recall that the difference in differences analysis also accounts for preexisting differences between treatment and control customers, since the difference in the pretreatment period (second difference) is subtracted from the difference in the treatment period (first difference). The subsections below include results for the three samples analyzed.

4.1.1 Singly Enrolled Customer Web Presentment Matching Results

We determine the closeness, or observable similarities, between the customers involved in the match by plotting hourly energy use in the pretreatment period for each enrollment window. We matched all of the 13,019 participants in our final sample. The matching process performed very well, with similar energy usage between treatment and control customers during the pretreatment periods for each enrollment window. For example, Figure 4-1 shows the comparison between average hourly energy use for CWP treatment and control customers during the pretreatment period on summer weekdays. The blue line represents the participant load shape and the orange line represents the control group load shape. The dotted red line that runs along the bottom of the graph represents the difference between the treatment and control groups. The results in the figure are for the enrollment window that corresponds to June through November 2011. The closeness of these matching results is representative of what we observed for the other CWP enrollment windows.

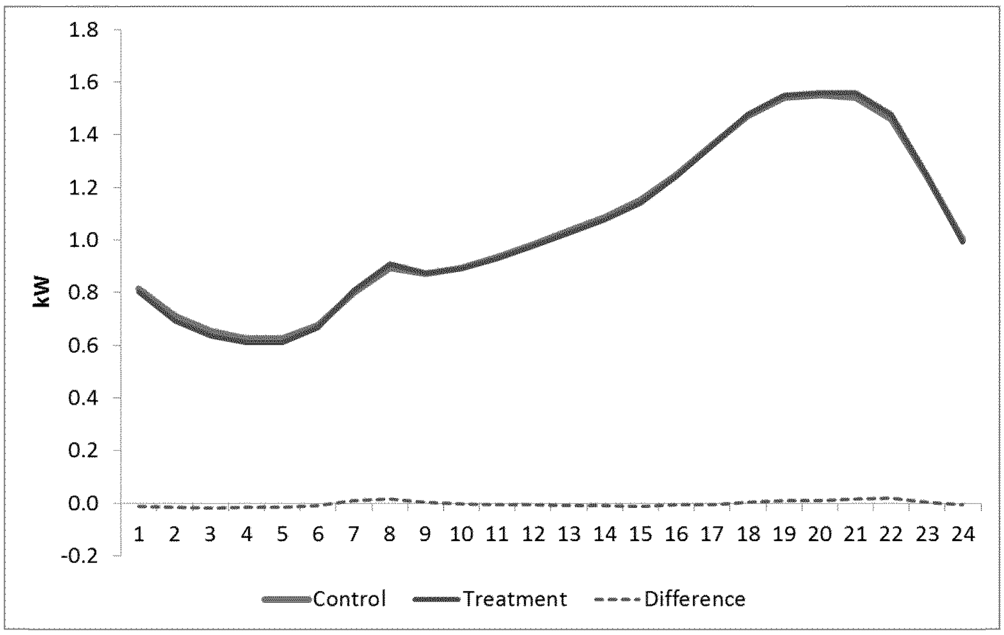
Figure 4-1 Pretreatment Usage Comparison for Singly Enrolled CWP Sample: Enrollment Window June through November 2011, Summer Weekday



4.1.2 Singly Enrolled Energy Alerts Matching Results

Again, we determined the closeness of the match for singly enrolled Energy Alerts participants by looking at hourly energy use in the pretreatment period for each enrollment window. We matched all of the 9,152 participants in our final sample. Much like CWP, the Energy Alerts matching performed well, with very similar usage between the treatment and control groups during the pretreatment period for each enrollment window. As an example, Figure 4-2 compares the average hourly summer weekday energy usage for the treatment and control customers in the June through November 2011 enrollment window. In general, the closeness of these matching results is representative of what we observed for the other Energy Alerts enrollment windows.

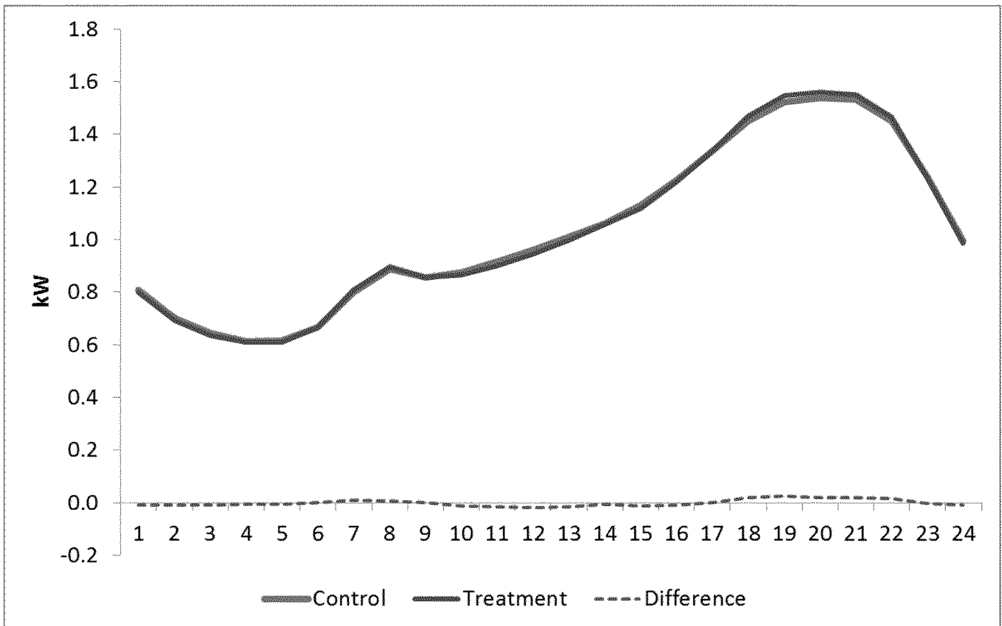
Figure 4-2 Pretreatment Usage Comparison for Singly Enrolled Energy Alerts Population: Enrollment Window June through November 2011, Summer Weekday



4.1.3 Dual Participation Matching Results

As with each singly enrolled sample, we also determined the closeness of the match for dual participants. We matched all of the 6,309 dual participants in our final sample. Once again, the matching performed well, with very similar usage between the treatment and control groups during the pretreatment period for most enrollment windows. As an example, Figure 4-3 compares the average hourly summer weekday energy usage for the treatment and control customers in the June through November 2011 enrollment group. The closeness of these matching results is representative of what we observed for all but the first enrollment group (December 2009 to May 2010), which was not quite as close.

Figure 4-3 Pretreatment Usage Comparison for Dual Participation Population: Enrollment Window June through November 2011, Summer Weekday



To quantify the degree to which pretreatment energy usage between the treatment and control customers was different, we ran hourly two-sample t-tests for each of the four day types in each of the enrollment windows for singly enrolled CWP participants, singly enrolled Energy Alerts participants, and dually enrolled participants. For each of the three samples in the June through November 2011 enrollment window, we conducted 24 hourly t-tests for each day type. That corresponds to 288 comparisons, only one of which was significant at the 95% level, but just barely (p-value = 0.0494). For succinctness, we only show t-tests comparing daily energy during summer and winter weekdays for the three program groups in the June through November 2011 enrollment window in Table 4-1 below. None of the comparisons are statistically significant.

Table 4-1 Comparison of Average Daily Energy: Enrollment Window June through November 2011

Subpopulation	Day Type	Control	Treatment	p-value
Singly Enrolled CWP	Summer Weekday	29.05	29.09	0.9279
	Summer Weekend	30.67	30.85	0.7090
	Winter Weekday	26.49	26.59	0.8144
	Winter Weekend	28.39	28.59	0.6573
Singly Enrolled Energy Alerts	Summer Weekday	25.18	25.13	0.8391
	Summer Weekend	26.65	26.74	0.7260
	Winter Weekday	23.56	23.58	0.9265
	Winter Weekend	25.37	25.47	0.6677
Dually Enrolled	Summer Weekday	24.85	24.84	0.9752
	Summer Weekend	26.33	26.45	0.7190
	Winter Weekday	23.25	23.23	0.9315
	Winter Weekend	25.02	25.15	0.6823

It should be noted that while in the section above we use a single enrollment window as an example to illustrate the matching results, we found that the results were very similar across all enrollment windows. We performed the hourly comparisons for each program, day type, and hour for each of the seven enrollment windows. In total, 1,536 comparisons were made. For CWP singly and dually enrolled participants, none of the comparisons were statistically significant. For Energy Alerts, there is at least one statistically significant comparison for enrollment window 5 in each of the matching day types. There is also the one in enrollment window 7 on a summer weekday. Overall, across all programs only 1.56% of hours are statistically significantly different from their matches.

4.2 CUSTOMER WEB PRESENTMENT RESULTS

4.2.1 CWP Energy Savings

In order to assess annual energy savings, we estimate savings at the monthly level using the difference in differences methodology. This provides an average per-participant savings estimate for each month in 2013. The annual total is simply the sum of each statistically significant point estimate and the associated percentage impact is based on the total estimated usage for the year—that is, the adjusted control group load.

Table 4-2 summarizes our findings for CWP, for both singly and dually enrolled participants. For singly enrolled CWP participants, we don't detect statistically significant savings in any months other than February, where participants seem to be using more, on average, than their matched control group. In fact, contrary to past evaluations, we see a negative savings estimate for singly enrolled CWP participants in all months except January. Later in this chapter, as we look at the segment level results, we find that these negative savings are being driven almost entirely by the "new" participants viewing the website less than 6 times in 2013. These consistent negative savings (even non-significant negative savings) are contrary to what we've seen in previous years. We believe this is due to the extended gap between the pretreatment period and the first view for new participants which results in approximately a 24 month gap between the pretreatment and treatment periods. While the pretreatment usage data matches the control group well for the 12 months that were used to establish a match, any matching process cannot account for trends in usage. If customers that tend to experience increasing consumption over time are also more likely to be CWP participants, then those customers may have had an increase in usage during the gap that could not have been accounted for. Such an increase will result in a bias, with treatment being higher than control, during the t reatment period which is unre lated to program participation.

Unfortunately, because we have no information regarding participation during the gap, we are unable to correct for this potential bias. In order to determine if it would be appropriate to assume that February is truly an anomalous month, we tested the overall annual savings estimate for the singly enrolled participants for significance, and found that at the annual level, the small increase in usage is NOT statistically significant. In light of th ese results, we believe it is appropriate to conclude that the one statistically significant estimate in February is attributable to bias, and does not reflect effects of the program. Therefore, we ignore those estimates in our final calculations of energy savings and assume they are zero.

Dually enrolled CWP participants , on the other hand, show statistically significant savings for all months of the year . The program level savings for singly enrolled CWP participants , excluding February , is 0%. Dually enrolled participa nts are saving, on average, 3.33 % across PY 2013.

Table 4-2 Average Per-Participant Energy Savings: All CWP Participants

Month	All Singly Enrolled Participants n= 503,019			All Dually Enrolled Participants n= 36,509		
	Savings (kWh)	Absolute Error (kWh)	% Impact	Savings (kWh)	Absolute Error (kWh)	% Impact
January	8.59	12.23	1.15%	22.94	16.02	2.86%
February	-23.08	19.17	-4.14%	15.14	14.85	2.44%
March	-6.58	16.33	-1.16%	18.60	11.62	2.98%
April	-7.43	10.32	-1.39%	15.48	9.59	2.61%
May	-6.48	12.71	-1.09%	26.73	9.87	3.96%
June	-3.22	12.30	-0.46%	28.64	13.09	3.43%
July	-2.97	13.46	-0.37%	40.76	14.19	4.11%
August	-4.39	12.10	-0.60%	37.87	12.19	4.25%
September	-3.62	10.19	-0.56%	29.50	9.79	3.92%
October	-7.29	8.94	-1.32%	16.32	8.00	2.67%
November	-4.82	9.73	-0.84%	23.47	8.82	3.68%
December	-11.69	14.66	-1.66%	18.50	12.22	2.35%
Annual Total	**0.00**[18]		**0.0%**	**293.96**		**3.33%**

Blue indicates statistically significant savings.

Figure 4-4 and Figure 4-5 depict the information shown in Table 4-2. We plot the savings estimates for singly and dually enrolled CWP participants as well the associated confide nce intervals. Savings estimates for singly enrolled participants, which are for the most part not statistic ally significant, are nearly flat across the year with the exception of January and February .

Dually enrolled participants show positive savings dur ing all months with higher savings during the summer months , reaching a maximum of 4.25% in August, and lower savings during the winter

[18] See text ab ove table. Unfortunately, because we have no information regarding participation during the gap, we are unable to correct for this potential bias. In order to determine if it would be appropriate to assume that February is truly an anomalo us month, we test ed the overall annual savings estimate for the singly enrolled participants for significance, and found that at the annual level, the small increase in usage is NOT statistically significant. In light of these results, we believe it is appro priate to concl ude that the one statistically significant estimate in February is attributable to bias, and does not reflect effects of the program. Therefore, we ignore those estimates in our final calculations of energy savings and assume they are zero.

months reaching a minimum of 2.35% in December . Because the dual participant savings are reported as part of both the CW P and Energy Alerts programs Figure 4-5 will be duplicated in the Energy Alerts section .

Figure 4-4 Average Per-Participant Energy Savings – All Singly Enrolled CWP Participants

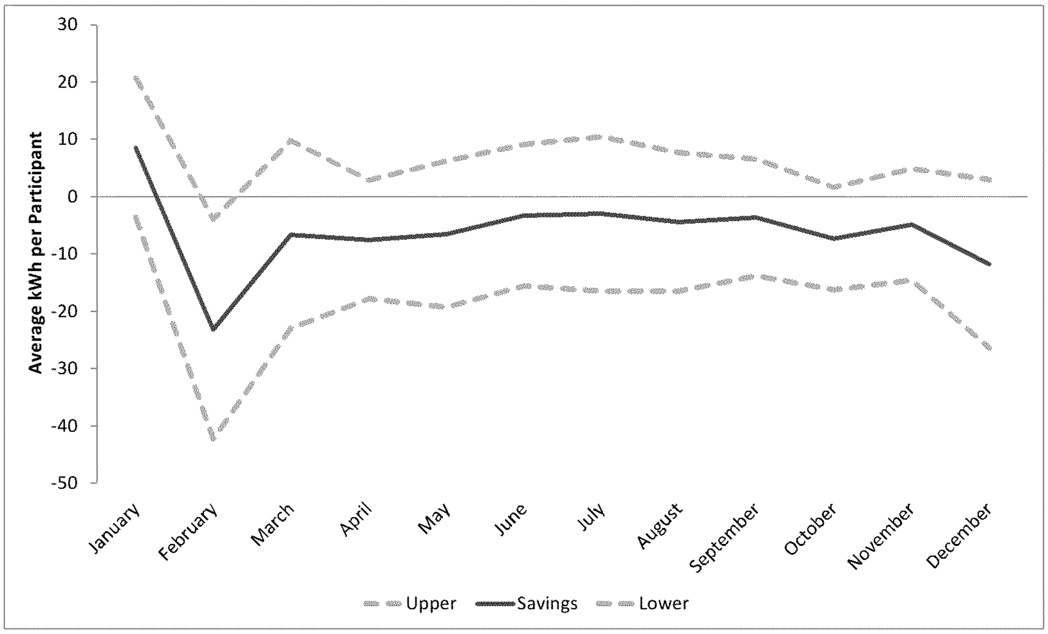
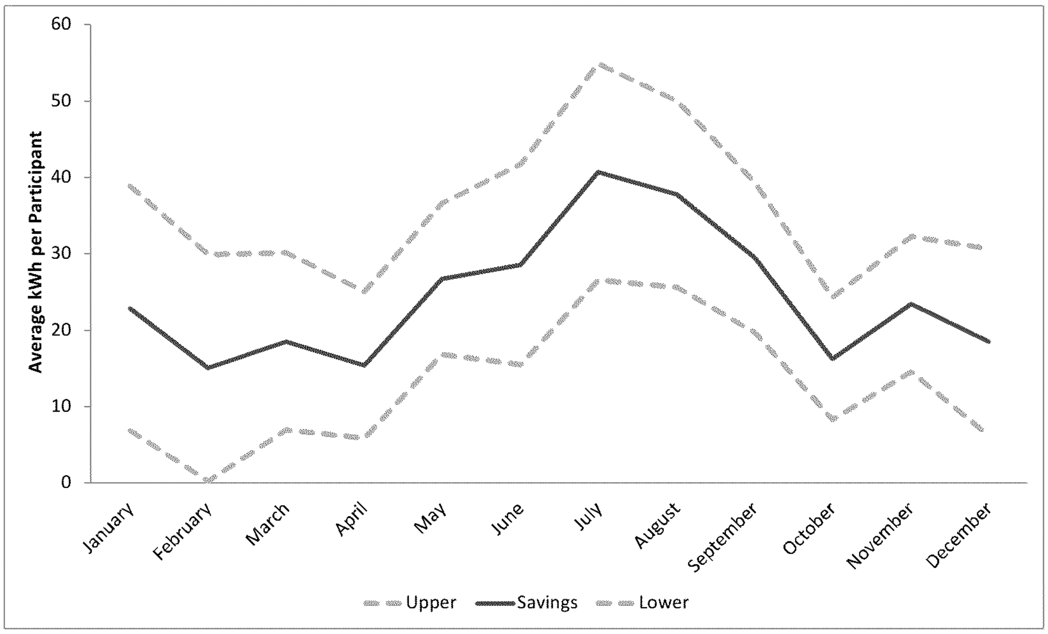


Figure 4-5 Average Per-Participant Energy Savings – All Dually Enrolled CWP Participants



In order to estimate the overall energy savings for the CWP program, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the energy savings for the two subpopulations. It is important to note that savings for dual participants will also be counted in the Energy Alerts section. We present the overall program level energy savings below in Table 4-3.

Table 4-3 Total Annual CWP Energy Savings: All CWP Participants[19]

Subpopulation	Number of Participants	Annual Savings (kWh per customer)	Total Savings (MWh)
Singly Enrolled Participants	503,019	0	0
Dually Enrolled Participants	36,509	294	10,732
Total CWP Energy Savings	**539,528**	**20**	**10,732**

Segment Level Results

We also perform a monthly analysis at the segment level (identical to the program level analysis above) for each of the 16 CWP segments; however presentation of the monthly segment level results in the body of the report is prohibitive. We do include a summary of the annual segment level impacts on a percentage basis in Figure 4-6 below. Overall, highly engaged participants save more energy than less engaged participants, which is consistent with the results of previous evaluations.

When we look at the segment level savings estimates in Figure 4-6 below we can clearly see that the new participants viewing the website less frequently are driving the negative savings estimates at the overall program level. Those viewing the website only once show consistent, negative savings across all months, while those that viewed the website between 2 and 6 times show mostly negative savings. Again, we believe this to be a result of the data gap that resulted in a pretreatment period beginning 12 prior to the start of treatment and we will set those savings estimates to zero when calculating the overall program savings.

All of the other segments, excluding participants viewing the web between 2 and 6 times in the continuing group show positive statistically significant estimates with the highest savings among those that are the most engaged. For the dually enrolled continuing participants, we see some statistically significant savings in all four engagement related segments, with the lowest savings estimate at 0.18% and the highest estimate at 5.63%. For the dually enrolled new participants, low but statistically significantly savings could only be estimated for the two highest engagement strata, with a low impact of 0.67% and a high impact of 0.86%.

[19] We do not include confidence intervals for the total annual savings estimates. We perform the analysis at the monthly level, and then we add the point estimates that are statistically significant across the months. This provides us with a valid estimate of the annual savings, and valid confidence intervals at the monthly level, however, we cannot similarly add the confidence bands across months to obtain an annual confidence interval. One must take into account the covariance between months. Given the complexity of the calculation, we did not estimate the annual confidence intervals here taking into account the covariance. However, one can be sure, given that each individual month is statistically significant, that the overall estimate will also be statistically significant.

Figure 4-6 Comparison of Average Annual Energy Savings Percent Impact by Segment

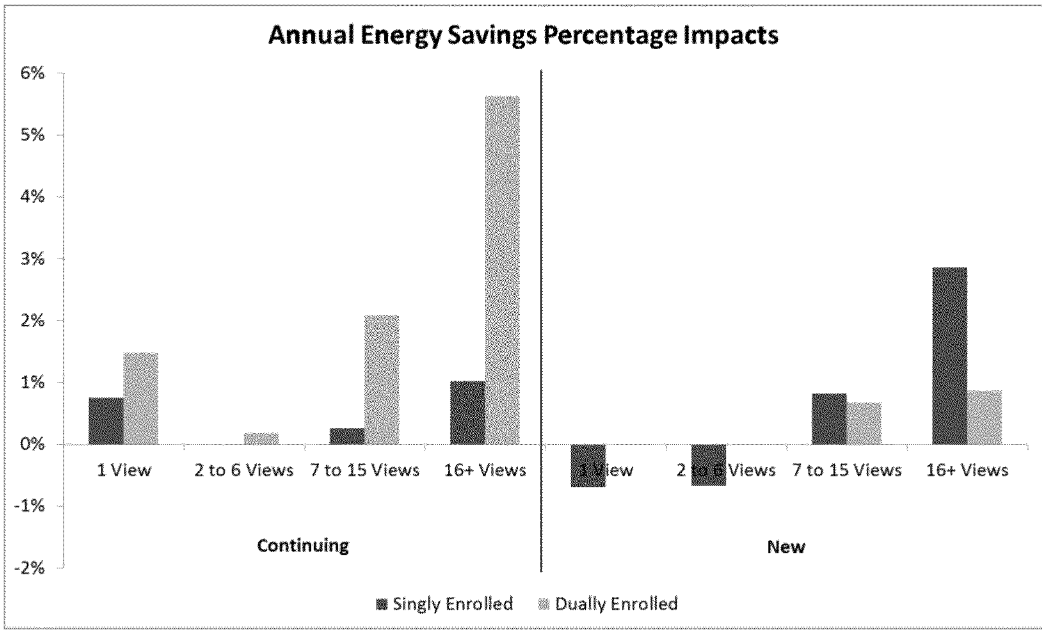


Table 4-4 below shows the estimate annual segment level savings for singly and dually enrolled program participants. The estimates were calculated by summing all of the statistically significant segment level estimates for both the dually and singly enrolled participants. The total annual savings based on the segment level estimates are different from the overall program savings shown above. This is because while we cannot always estimate statistically significant savings at the program level because of the variation among customers, we are often able to estimate the savings at the segment level. We present these estimates to provide insight into which customers are saving more or less across segments only, we use estimates in Table 4-3 above when we claim savings for the CWP program as a whole.

Based on the segment level estimates, the total MWh savings attributable to the singly enrolled participants is 6,887 MWh, recall that the savings at the program level, are in fact, zero. This is because the savings we are able to estimate within higher engagement strata in Table 4-4 are being obscured by the large number of participants in the lower engagement strata. The total MWh savings attributable to the dually enrolled participants is 2,220 MWH, which is less overall but much higher on a per customer level. In this case the total savings actually went down, this is because the savings among the dual participant group is spread more evenly across segments. So as we moved from the overall population level to the segment level we lost the ability to see the smaller savings estimates in the lower engagement strata as our sample size decreased.

Table 4-4 2013 CWP Segment Level Annual Energy Savings

Segment	Number of Participants	Annual Savings	Total Estimated Savings (MWh)
	Singly Enrolled		
Continuing: 1 View	16,781	63.08	1,059
Continuing: 2 to 6 Views	22,495	NS	NS
Continuing: 7 to 15 Views	6,118	23.90	146
Continuing: More than 15 Views	3,517	96.98	341
New: 1 View	241,904	NS[20]	-
New: 2 to 6 Views	171,015	NS[21]	-
New: 7 to 15 Views	25,110	58.49	1,469
New: More than 15 Views	16,079	240.84	3,872
Total	**503,019**	**13.69**	**6,887**
	Dually Enrolled		
Continuing: 1 View	4,052	141.99	575
Continuing: 2 to 6 Views	6,403	16.83	108
Continuing: 7 to 15 Views	1,997	197.99	395
Continuing: More than 15 Views	1,435	592.23	861
New: 1 View	7,832	NS	-
New: 2 to 6 Views	10,223	NS	-
New: 7 to 15 Views	2,697	54.88	148
New: More than 15 Views	1,870	77.04	144
Total	**36,509**	**60.82**	**2,220**

4.2.2 CWP Demand Savings

In addition to the monthly analysis, EnerNOC evaluated the daily impacts at the program level by using the difference in differences methodology on hourly data. We created eight specific day types, shown in the following table, and provide information on the on- and off-peak savings estimates for each day type. The day types were based on the distribution of average daily temperatures in each participant and control group customer's representative weather station. The development of the day types is described in more detail above in Chapter 3. The on-peak period is defined as the hours between 12:00p and 6:00p. When we calculate the per-participant demand savings in the tables in this section, we include all hours regardless of significance.[22]

At the program level, we were unable to detect statistically significant savings across any day type for the singly enrolled participants. For the dually enrolled participants, by contrast, we were able to detect statistically significant savings during all day types in both the on- and off-peak periods.

[20] At the segment level we are detecting statistically significant negative savings, however, we are assuming that those negative savings are a result of bias (see discussion above) and therefore we treat them as if they are not statistically significant when estimating total energy savings.

[21] See footnote 15 above.

[22] We included all hours in the estimate of the on peak impact, regardless of statistical significance, because each is still a valid estimate. The on peak impact is the sum of the estimates, which are each random variables with a mean and a variance. The mean of the sum of the random variables is equal to the sum of the means of the random variables. The drawback of this approach is that because the estimates are correlated, they are not independent, so calculating the variance (and therefore the confidence interval or the significance) of that sum requires the use of all the covariances between all the estimates. The complexity of this process made it impractical here. However, if all or most of the individual estimates are significant, then it is very likely that their sum will also be significant.

Still, the savings presented for the dually enrolled participants below in Table 4-5 are small ranging between 2 and 4 percent with a magnitude of less than 1/10 th of a kW.

Table 4-5 Average Per-Participant Demand Savings: All Dually Enrolled Participants

Day Type	All Dually Enrolled Participants n = 36,509			
	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Hot Summer	0.091	4.33%	0.038	2.80%
Typical Summer	0.066	5.52%	0.027	2.84%
Cool Summer	0.034	4.29%	0.020	2.46%
Summer Weekend	0.064	4.29%	0.028	2.68%
Cold Winter	0.040	3.87%	0.023	2.05%
Typical Winter	0.032	3.55%	0.024	2.62%
Warm Winter	0.031	3.63%	0.020	2.47%
Winter Weekend	0.035	3.29%	0.022	2.33%

In order to estimate the overall demand savings for the CWP program on a hot summer day, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the energy savings for the two subpopulations. It is important to note that savings for dual participants will also be counted in the Energy Alerts section. We present the overall program level energy savings below in Table 4-6.

Table 4-6 2013 CWP Program Level On-peak Demand Savings: Hot Summer Days

Subpopulation	Number of Participants	Average Impact (kW per customer)	Total Impact (MW)
Singly Enrolled Participants	503,019	0	0.00
Dually Enrolled Participants	36,509	0.091	3,322
Total CWP Energy Savings	**539,528**	**0.006**	**3,322**

Segment Level Results

Overall, looking at on - and off-peak savings across all CWP segments we concluded the following:

- We were unable to detect consistent and meaningful statistically significant savings by day type for the less engaged participants. More specifically, t hose customers that viewed the website less than 7 times in 201 3 (both the singly and dually enrolled groups) displayed near zero savin gs estimates for all day types.
- Consistent with the monthly results, and analyses from previous years, we were able to estimate statistically significant savings more often for the mor e highly engaged participants, those that viewed the website more than 7 times, particularly on "hot" and "typical" summer days.

Based on these high level findings, we have included on - and off-peak impacts and average daily load shapes for participants th at viewed the web 7 or more times during 2013, on "hot" and "typical" summer days in the subsections below.

CWP Engagement Segment: More than 15 views

This section focuses on the most highly engaged participants, those with more than 15 views in 2013. Table 4-7 below shows the on- and off-peak impacts on both the "hot" and "typical" summer weekdays by CWP segment. For both the singly and the dually enrolled participants, the on-peak impacts on hot and typical days ranges from 5% to about 13% with the continuing, singly enrolled customers saving the least, and the new, dually enrolled customers saving the most. During the off-peak period, the savings are smaller, but still in the 5% to 8% range for dually enrolled customers. For the singly enrolled customers the savings are very small or negative, which indicates that these customers are probably not taking action during the off-peak period. The singly enrolled new customers, however, do show some small savings in the off-peak.

Table 4-7 Average Per-Participant Demand Savings CWP Participants: More than 15 Views[23]

More than 15 Views						
Segment		Day Type	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Singly	Continuing	Hot Summer	0.137	5.87%	0.024	1.62%
		Typical Summer	0.067	5.12%	-0.012	-1.18%
	New	Hot Summer	0.142	6.66%	0.050	3.58%
		Typical Summer	0.092	7.20%	0.029	2.89%
Dually	Continuing	Hot Summer	0.191	7.23%	0.105	6.27%
		Typical Summer	0.126	8.48%	0.093	8.13%
	New	Hot Summer	0.317	13.42%	0.089	5.97%
		Typical Summer	0.141	10.66%	0.059	5.63%

Below in Figure 4-7 and

Figure 4-8 we present the average per customer savings and load shapes for singly enrolled CWP participants that viewed the website more than 15 times during 2013 on an average hot summer day.[24] These shapes are representative of the impacts on hot summer days presented in Table 4-7 above. The graph on the left shows the savings shape (or the second difference) and associated confidence intervals. The graph on the right shows the adjusted control group load and the treatment load shape.

When we look at the two figures below we see a clear separation between the treatment and control group load, particularly during the on-peak period. We also see a corresponding savings shape that is above the zero line for much of the day with several statistically significant hours of savings during the on-peak period.

[23] Note that we included all of the hours during the on- and off-peak periods in the estimate of kW savings regardless of significance, see footnote 12 above for a more detailed explanation.

[24] We include only the load shapes for the singly enrolled participants in order to illustrate the load shapes and savings shape. We do not include load shapes for the dually enrolled participants in the body of the report.

Figure 4-7 Average Per-Participant Savings: Hot Summer Day, Singly Enrolled, Continuing Participants, More than 15 Views

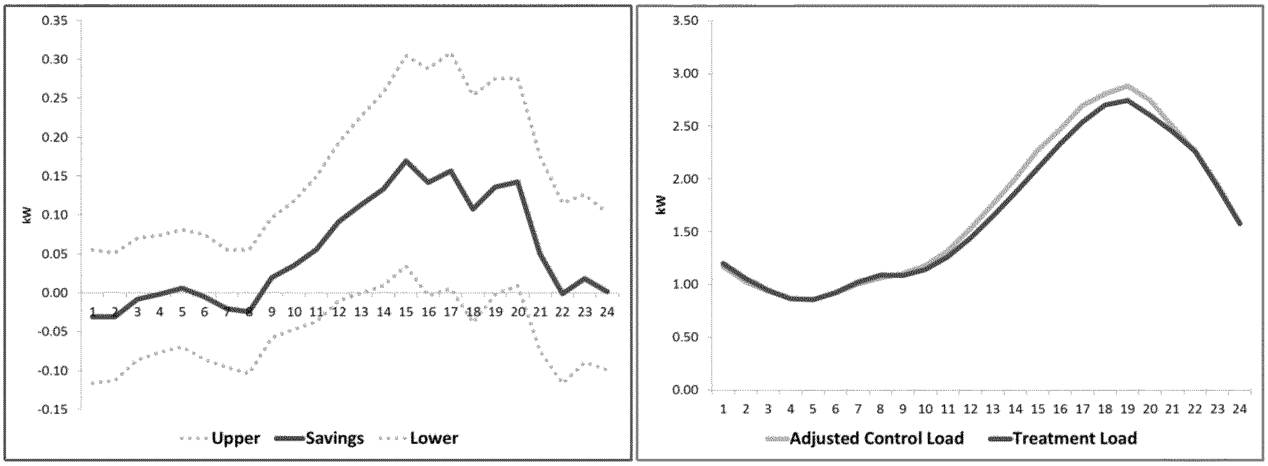
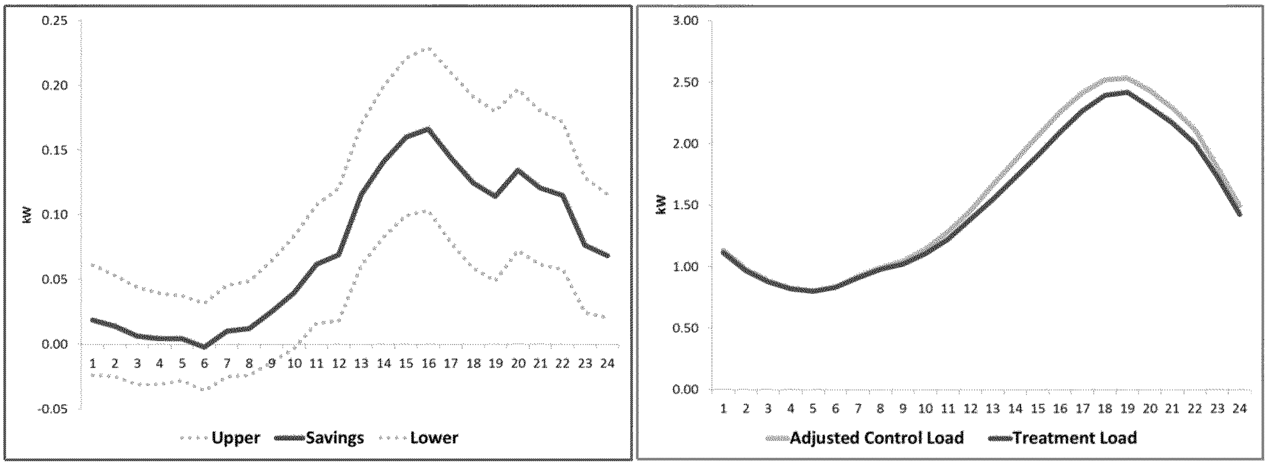


Figure 4-8 Average Per-Participant Savings: Hot Summer Day, Singly Enrolled, New Participants, More than 15 Views



We do not include the load shapes for the dually enrolled participants; however they are similar to those for singly enrolled participants presented above.

CWP Engagement Segment: 7 to 15 Views

This section focuses on the participants that viewed the web between 7 and 15 times during 2013. Table 4-8 below shows the on and off-peak impacts on both the "hot" and "typical" summer weekdays by CWP segment.

We see a similar savings pattern among those that viewed the website 7 to 15 times, as we do in those that viewed it more than 15 times. Overall, dually enrolled participants save a higher percentage during both the on-peak and the off-peak period, while singly enrolled participants save moderately during the on-peak but save very little, or nothing, during the off-peak.

Table 4-8 Average Per-Participant Demand Savings CWP Participants: 7 to 15 Views[25]

7-15 Views

[25] Note that we included all of the hours during the on- and off-peak periods in the estimate of kW savings regardless of significance, see footnote 12 above for a more detailed explanation.

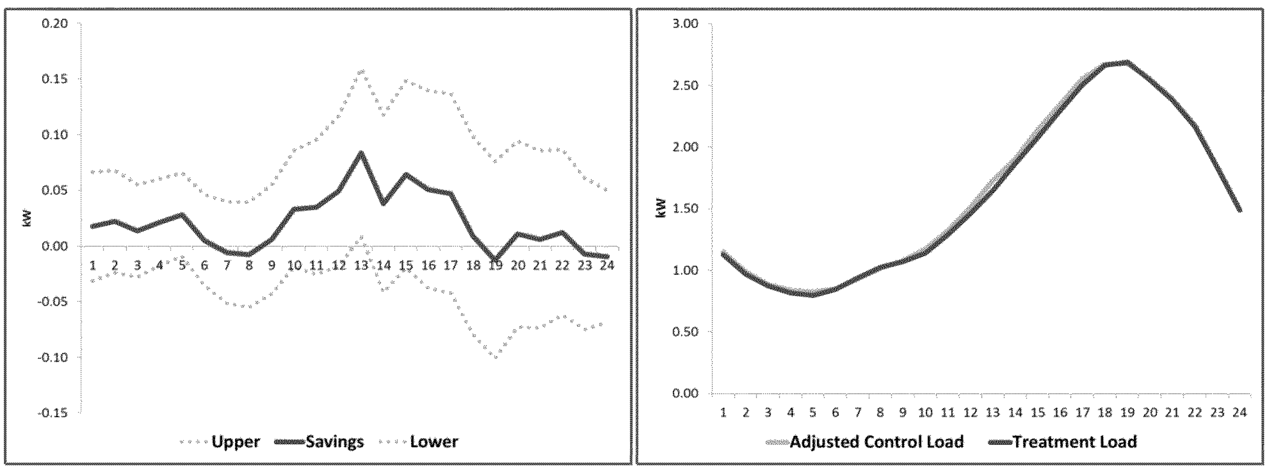
Segment		Day Type	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Singly	Continuing	Hot Summer	0.049	2.20%	0.012	0.85%
		Typical Summer	0.044	3.51%	0.002	0.24%
	New	Hot Summer	0.043	2.46%	0.009	0.78%
		Typical Summer	0.036	3.54%	0.005	0.60%
Dually	Continuing	Hot Summer	0.164	6.78%	0.089	5.77%
		Typical Summer	0.094	7.18%	0.056	5.33%
	New	Hot Summer	0.106	5.33%	0.055	3.96%
		Typical Summer	0.076	6.30%	0.026	2.67%

Below in

Figure 4-9 and Figure 4-10 we present the average per customer savings and load shapes for singly enrolled CWP participants that viewed the website between 7 and 15 times during 2013 on an average hot summer day. [26] Again, these shapes are representative of the impacts on hot summer days presented in Table 4-8 above.

As the point estimates in the table would suggest, when we look at the graphs for the singly enrolled participants, we do not notice a distinct separation between the treatment and control group lines in the load shapes on the right. However, the savings shapes are mostly above the zero line in the graphs on the left, with several significant intervals in the on-peak period in Figure 4-10.

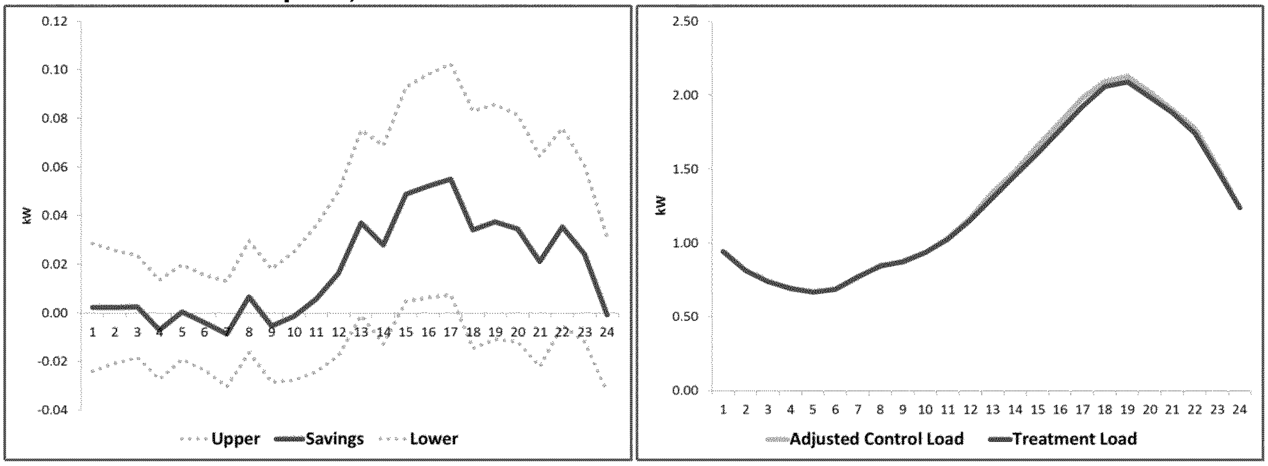
Figure 4-9 Average Per-Participant Savings: Hot Summer Day, Singly Enrolled, Continuing Participants, 7 to 15 Views



[26] We include only the load shapes for the singly enrolled participants in order to illustrate the load shapes and savings shapes. We do not include load shapes for the dually enrolled participants in the body of the report.

SB_GT&S_0098984

Figure 4-10 Average Per-Participant Savings: Hot Summer Day, Singly Enrolled, New Participants, 7 to 15 Views



We do not include the load shapes for the dually enrolled participants; however they are similar to those for singly enrolled participants presented above.

EnerNOC was also interested in quantifying the total on-peak demand impacts on the most relevant day type—the hot summer days. We estimated this impact by summing all of the statistically significant segment level estimates for both the dually and singly enrolled participants. We estimate the impacts in this manner because while we cannot estimate always estimate statistically significant savings at the program level because of the variation among customers, we are often able to estimate the savings at the segment level.

In Table 4-9 below, we present the estimated on-peak kW impacts for each CWP segment; we also indicate whether the estimate was significant, and the total recognized impact for that segment. At the bottom of the table, we sum the recognized, or significant, on-peak impacts across segments for singly and dually enrolled participants to estimate the impacts for the entire program. [27]

As with the segment level energy savings, the demand savings estimates are different from the program level estimates. This is because while we cannot always estimate statistically significant savings at the program level because of the variation among customers, we are often able to estimate the savings at the segment level. We present these estimates to provide insight into which customers are saving more or less across segments only, we use estimates in Table 4-6 above when we claim savings for the CWP program as a whole.

In the top half of the table we present the results for the singly enrolled participants by segment. Of the singly enrolled participants, only the most engaged showed a significant savings estimate, with a total on-peak impact of 2.7 MW. In the bottom half of the tables, we present the results for the dually enrolled participants by segment, overall the dually enrolled participants save more than those singly enrolled, with significant estimates for continuing customers who viewed the website, 1 time, 7 to 15 times, and more than 15 times. Of the new dually enrolled, only those that viewed the website more than 15 times showed significant savings. The total on-peak impact for the dually enrolled customers is 1.7 MW.

[27] We determined whether to consider an estimate significant based on the percentage of significant hours within each period. An estimate had to have at least three significant intervals and all intervals had to have the same sign, i.e. all positive or all negative in order to be included in the table above as significant. By doing this we are assuming that if we were to explicitly estimate confidence intervals for the on-peak period in questions, they would maintain overall significance, even though some individual hours may not be significant on their own.

Table 4-9 2013 CWP Segment Level On-peak Demand Savings: Hot Summer Days

Segment	Number of Participants	Average On-peak Impact (kW)	Total Estimated Impact (kW)
Singly Enrolled Participants			
Continuing: 1 View	16,781	NS	-
Continuing: 2 to 6 Views	22,495	NS	-
Continuing: 7 to 15 Views	6,118	NS	-
Continuing: More than 15 Views	3,517	0.137	482
New: 1 View	241,904	NS	-
New: 2 to 6 Views	171,015	NS	-
New: 7 to 15 Views	25,110	NS	-
New: More than 15 Views	16,079	0.142	2,283
Total	**503,019**	**0.005**	**2,765**
Dually Enrolled Participants			
Continuing: 1 View	4,052	0.127	515
Continuing: 2 to 6 Views	6,403	NS	-
Continuing: 7 to 15 Views	1,997	0.164	328
Continuing: More than 15 Views	1,435	0.191	274
New: 1 View	7,832	NS	-
New: 2 to 6 Views	10,223	NS	-
New: 7 to 15 Views	2,697	NS	-
New: More than 15 Views	1,870	0.317	593
Total	**36,509**	**0.047**	**1,710**

4.3 ENERGY ALERTS RESULTS

4.3.1 Energy Alerts Energy Savings

Program Level Results

Customers participating in Energy Alerts show statistically significant savings for nearly every month of 2013. Dually enrolled customers save more in May through September while singly enrolled customers save more in the remaining months. For both groups, they save on average just over 3% in energy across the year, with dually enrolled participants saving slightly more. The monthly savings in kWh and as a percentage are presented below in Table 4-10.

Table 4-10 Average Per-Participant Energy Savings: All EAL Participants

Month	All Singly Enrolled Participants n = 26,415			All Dually Enrolled Participants n = 36,509		
	Savings (kWh)	Absolute Error (kWh)	% Impact	Savings (kWh)	Absolute Error (kWh)	% Impact
January	24.90	7.36	3.28%	22.94	16.0	2.86%
February	23.49	5.94	3.75%	15.14	14.9	2.44%
March	20.47	5.91	3.27%	18.60	11.6	2.98%
April	17.24	5.49	2.88%	15.48	9.6	2.61%
May	23.03	6.20	3.39%	26.73	9.9	3.96%
June	21.52	8.90	2.57%	28.64	13.1	3.43%
July	23.71	9.86	2.42%	40.76	14.2	4.11%
August	22.14	8.27	2.53%	37.87	12.2	4.25%
September	21.19	6.89	2.85%	29.50	9.8	3.92%
October	18.57	5.81	3.02%	16.32	8.0	2.67%
November	24.05	6.19	3.78%	23.47	8.8	3.68%
December	27.11	8.94	3.45%	18.50	12.2	2.35%
Annual Total	**267.43**		**3.05%**	**293.96**		**3.33%**

Blue indicates statistically significant savings.

Figure 4-11 and Figure 4-12 depict the information shown in Table 4-10. We plot the savings estimates fo r singly and dually enrolled Energy Alerts participants as well the associated confidence intervals. Savings estimates for singly enrolled participants are all statistically si gnificant and relatively flat across the year with the exception of the shoulder months, which have slightly lower savings. Dually enrolled participants also show positive savi ngs during all months with higher savings during the summer months , and lower sa vings during the winter and s houlder months.

Figure 4-11 Average Per-Participant Energy Savings – All Singly Enrolled EAL Participants

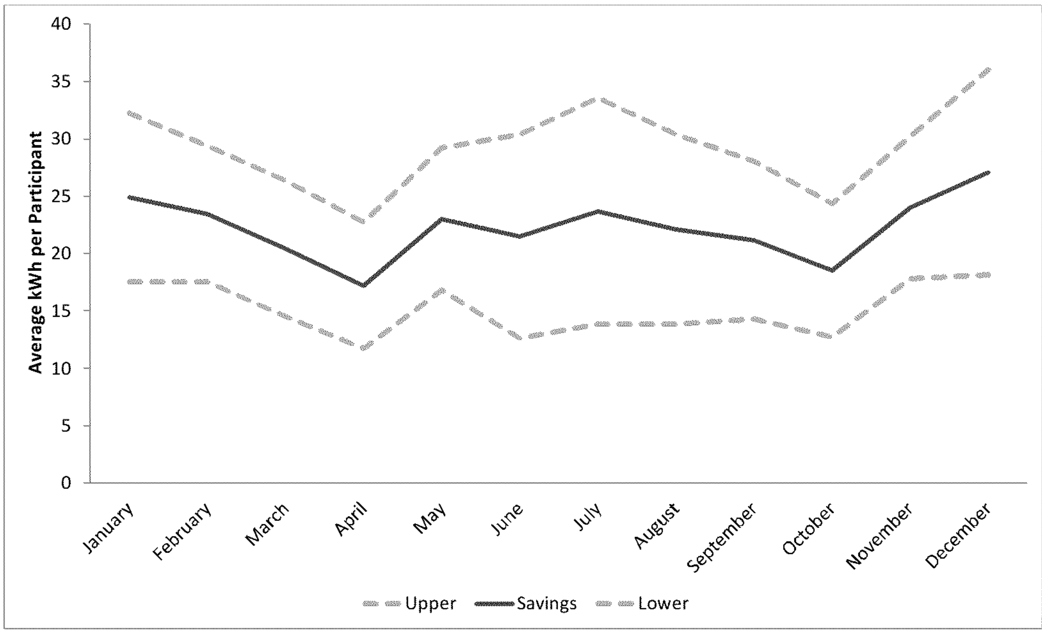
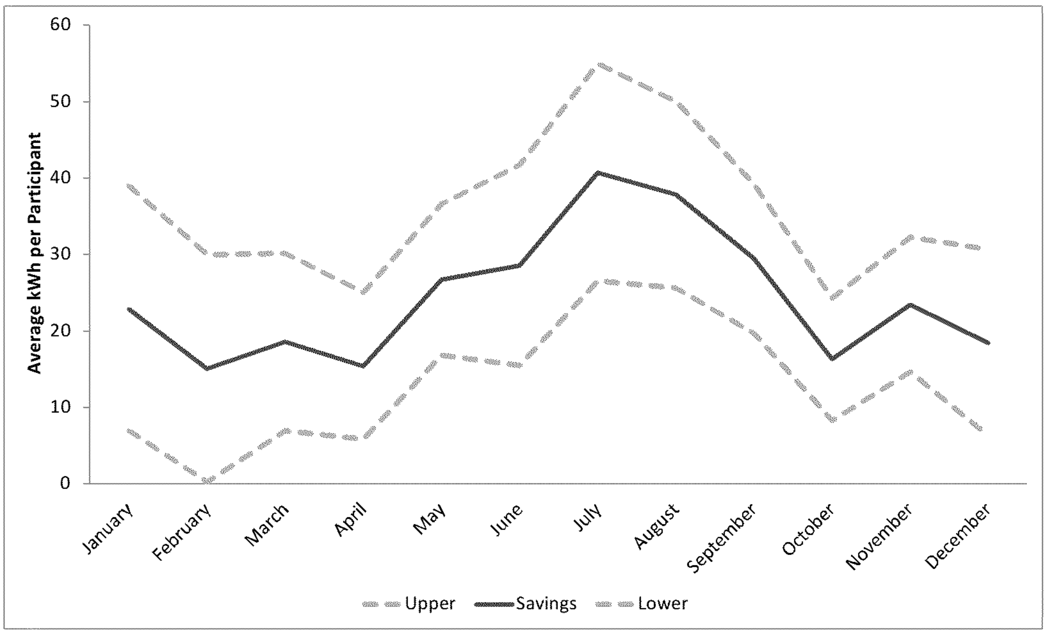


Figure 4-12 Average Per-Participant Energy Savings – All Dually Enrolled EAL Participants



To estimate the overall energy savings for the Energy Alerts program, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the energy savings for the two subpopulations. It is important to note that savings for dual participants was also counted in the CWP section. We present the overall program level energy savings below in Table 4-11.

Table 4-11 Total Annual Energy Alerts Energy Savings: All EAL Participants[28]

Subpopulation	Number of Participants	Annual Savings (kWh per customer)	Total Savings (MWh)
Singly Enrolled Participants	26,415	267.43	7,064
Dually Enrolled Participants	36,509	293.96	10,732
Total Energy Alerts Energy Savings	**62,924**	**282.82**	**17,796**

Segment Level Results

We also perform a monthly analysis at the segment level (identical to the program level analysis above) for each of the 8 Energy Alerts segments; however presentation of the monthly segment level results in the body of the report is prohibitive. We do include a summary of the annual segment level impacts on a percentage basis in Figure 4-13 below.

Participants elect to receive alerts via e-mail or SMS and are grouped b ased on whether they receive five alerts or fewer or more tha n five alerts in the year. For both the singly and dually enrolled groups, participants receiving five alerts or fewer show larger statistically significant savings on an annual basis, ranging fr om 14% to 16%. While these estimates seem quite high, they are only slightly larger than the 2012 savings estimates for this group which ranged from 11% to 13%.

In contrast for those receiving more than 5 alerts, we were only able to estimate savings for s ingly enrolled participants receiving alerts via email. These savings are down from last year, where we were able to estimate small savings ranging betwee n 1 and 2% for these customers.

Figure 4-13 Comparison of Average Annual Energy Savings Percent Impact by Segment

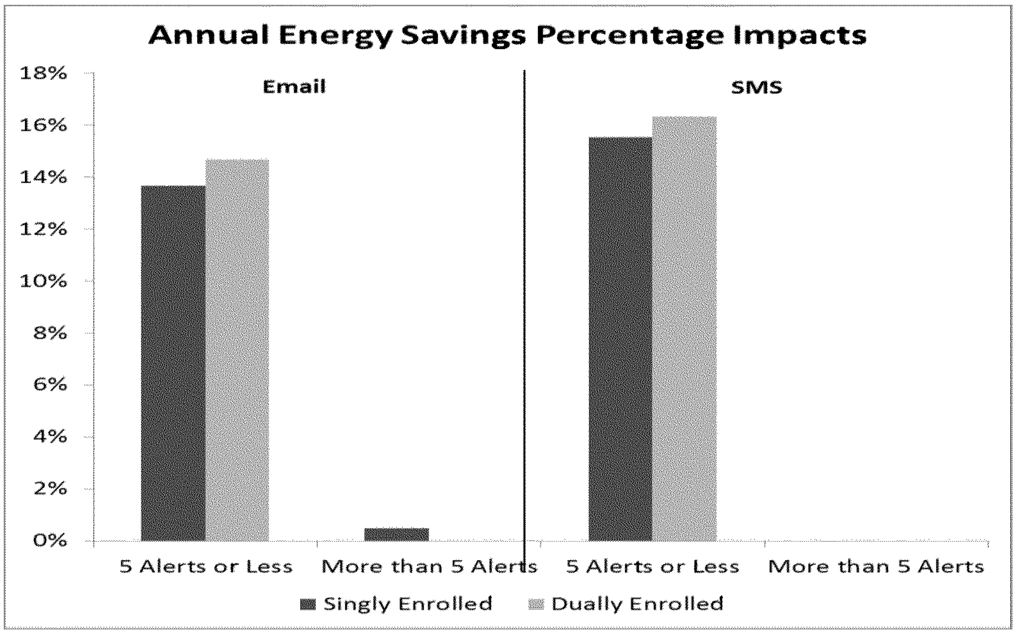


Table 4-12 below shows the estimated annual segment level savings for singly and dually enrolled program participants. The estimates were calculated by summing all of the statistically significant

[28] We do not include confidence intervals for the total annual savings estimates. We perform the analysis at the monthly level, and then we add the point estimates that are statistically significant across the months. This provides us with a valid estimate of the annual savings, and valid confidence intervals at the monthly level, however, we cannot similarly add the confidence bands across months to obtain an annual confidence interval. One must take into account the covariance between months. Given the complexity of the calculation, we did not estimate the annual confidence intervals here taking into account the covariance. However, one can be sure, given that each individual month is statistically significant, that the overall estimate will also be statistically significant.

segment level estimates for both the dually and singly enrolled participants. The total annual savings based on the segment level estimates are different from the overall program savings shown above. This is because while we cannot always estimate statistically significant savings at the program level because of the variation among customers, we are often able to estimate the savings at the segment level. We present these estimates to provide insight into which customers are saving more or less across segments only, we use estimates in Table 4-11 above when we claim savings for t he Energy Alerts program as a whole.

The segment level savings attributable to the singl y enrolled participants is 6,300 MWh. These savings are primarily coming from participants receiving 5 or fewer alerts, as we have s een in past years. The segment leve l savings attributable to the duall y enrolled participants is 9,982 MWH, which is higher on both a per -customers basis and an absolute basis because there are more dually enrolled than singly enrolled Energy Alerts participants.

Table 4-12 2013 Energy Alerts Segment Level Annual Energy Savings

Segment	Number of Participants	Annual Savings	Total Estimated Savings (MWh)
Singly Enrolled			
Email: Fewer than 5 Alerts	4,520	744.36	3,365
Email: More than 5 Alerts	12,598	45.07	568
SMS: Fewer than 5 Alerts	2,508	943.99	2,368
SMS: More than 5 Alerts	6,789	NS	NS
Total	**26,415**	**238.49**	**6,300**
Dually Enrolled			
Email: Fewer than 5 Alerts	7,493	840.22	6,296
Email: More than 5 Alerts	16,293	NS	NS
SMS: Fewer than 5 Alerts	3,602	1023.51	3,687
SMS: More than 5 Alerts	9,121	NS	NS
Total	**36,509**	**273.42**	**9,982**

4.3.2 Energy Alerts Demand Savings

Program Level Results

In addition to the monthly analysis, EnerNOC evaluated the daily impacts at the program level by using the difference in differences methodology on hourly data. We created eight specific day types, shown in the following two tables, and provide information on the on- and off-peak savings estimates for each day type. The day types were based on the distribution of average daily temperatures in each participant and control group customer's representative weather station . The development of the day types is de scribed in more detail above in Chapter 3 . The on-peak period is defined as the hours between 12:00p and 6:00p. When we calculate the per -participant demand savings in the tables in this section, we include all hours regardless of significance. [29]

At the pr ogram level, we were able to detect statistically significant savings across most day type s for both the singly and dually enrolled participants. The average impacts in all cases are small,

[29] We included all hours in the estimate of the on peak impact, regardless of statistical significance, because each is still a valid estimate. The on peak impact is the sum of the estimates, which are each random variables with a mean and a variance. The mean of the sum of the random variables is equal to the sum of the means of the random variables. The drawback of this approach is that because the estimates are correlated, they are not independent, so calculating the variance (and therefore the confidence interval or the significance) of that sum requires the use of all the covariances between all the estimates. The complexity of this process made it impractical here. However, if all or most of the individual estimates are significant, then it is very likely that their sum will also be significant.

ranging from about 2% to 4.5% for singly enrolled participants and from 2% to 5.5% for dually enrolled participants.

Table 4-13 Average Per-Participant Demand Savings: All Singly Enrolled Participants

Day Type	All Singly Enrolled Participants n = 26,415			
	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Hot Summer	0.048	2.37%	0.032	2.36%
Typical Summer	0.041	3.48%	0.024	2.51%
Cool Summer	0.025	3.10%	0.021	2.59%
Summer Weekend	0.044	2.99%	0.024	2.38%
Cold Winter	0.045	4.37%	0.042	3.78%
Typical Winter	0.030	3.44%	0.031	3.43%
Warm Winter	0.039	4.51%	0.028	3.41%
Winter Weekend	0.031	2.90%	0.030	3.19%

Table 4-14 Average Per-Participant Demand Savings: All Dually Enrolled Participants

Day Type	All Dually Enrolled Participants n = 36,509			
	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Hot Summer	0.091	4.33%	0.038	2.80%
Typical Summer	0.066	5.52%	0.027	2.84%
Cool Summer	0.034	4.29%	0.020	2.46%
Summer Weekend	0.064	4.29%	0.028	2.68%
Cold Winter	0.040	3.87%	0.023	2.05%
Typical Winter	0.032	3.55%	0.024	2.62%
Warm Winter	0.031	3.63%	0.020	2.47%
Winter Weekend	0.035	3.29%	0.022	2.33%

In order to estimate the overall demand savings for the Energy Alerts program, we multiply the average annual per participant savings by the total number of singly and dually enrolled participants. We can then sum the energy savings for the two subpopulations. It is important to note that savings for dual participants were also counted in the CWP section. We present the overall program level energy savings below in Table 4-15.

Table 4-15 Total Annual On-Peak Energy Alerts Demand Savings: Hot Summer Days

Subpopulation	Number of Participants	Average Impact (kW per customer)	Total Impact (MW)
Singly Enrolled Participants	26,415	0.048	1,268
Dually Enrolled Participants	36,509	0.091	3,322
Total Energy Alerts Energy Savings	**62,924**	**0.073**	**4,590**

Segment Level Results

Overall, looking at on and off peak savings across all Energy Alerts segments we concluded the following:

- For Energy Alerts, we were unable to detect consistent and meaningful statistically significant savings by day type for those participants receiving more than 5 alerts in 2013. This is true of both singly and dually enrolled participants, and is consistent with the monthly savings results presented in the previous section.
- Consistent with the monthly results, and analysis results of 2012, we were able to estimate statistically significant savings across all day types for those customers that received 5 alerts or fewer.

Based on these high level findings, we have included on and off-peak impacts and average daily load shapes for participants that received alerts 5 or fewer times during 2013. We include only the results for "hot" and "typical" summer days to allow for comparison with the CWP results presented earlier in this chapter.

Energy Alerts Engagement Segment: 5 or fewer Alerts

This section focuses on the participants that received 5 alerts or fewer during 2013. Table 4-16 below shows the on and off-peak impacts on both the "hot" and "typical" summer weekdays for both singly and dually enrolled participants receiving fewer than 5 alerts by delivery segment (SMS vs. Email).

The average on-peak impacts for both hot summer and typical summer days are very high for this group of participants, with on-peak impacts in excess of 25%, and off-peak impacts exceeding 19% for dually enrolled participants. Even in the single enrolled group the impacts are much larger than we saw for CWP, ranging from 10% to 20% in the on-peak and from 11% to 16% in the off-peak.

Table 4-16 Average Per-Participant Demand Savings Energy Alerts Participants: 5 or Fewer Alerts

5 or Fewer Alerts						
Segment		Day Type	Average On-peak kW Reduction	Average On-peak % Impact	Average Off-peak kW Reduction	Average Off-peak % Impact
Singly	SMS	Hot Summer	0.111	10.49%	0.083	11.15%
		Typical Summer	0.096	14.61%	0.077	13.71%
	Email	Hot Summer	0.238	18.25%	0.149	16.24%
		Typical Summer	0.157	20.41%	0.110	16.93%
Dually	SMS	Hot Summer	0.227	18.46%	0.121	14.65%
		Typical Summer	0.143	19.93%	0.091	15.11%
	Email	Hot Summer	0.360	25.76%	0.195	19.87%
		Typical Summer	0.216	26.54%	0.123	17.92%

Below in Figure 4-14 and Figure 4-15 we present the average per customer savings and load shapes for singly enrolled Energy Alerts participant receiving 5 or fewer alerts in 2013 on an average hot summer day. [30] These shapes are representative of the impacts on hot summer days presented in Table 4-16 above. The graph on the left shows the savings shape (or the second difference) and associated confidence intervals. The graph on the right shows the adjusted control group load and the treatment load shape.

[30] We include only the load shapes for the singly enrolled participants in order to illustrate the load shapes and savings shapes. We do not include load shapes for the dually enrolled participants in the body of the report.

As the point estimates in the table would suggest, when we look at the graphs for the singly enrolled participants, notice a large and distinct separation between the treatment and control group lines in the load shapes on the right. We also see savings shapes well above the zero line, with more savings concentrated during the on-peak period, but still some very significant savings during the off-peak period.

Figure 4-14 Average Per-Participant Savings: Hot Summer Day, Singly Enrolled, SMS, 5 or Fewer Alerts

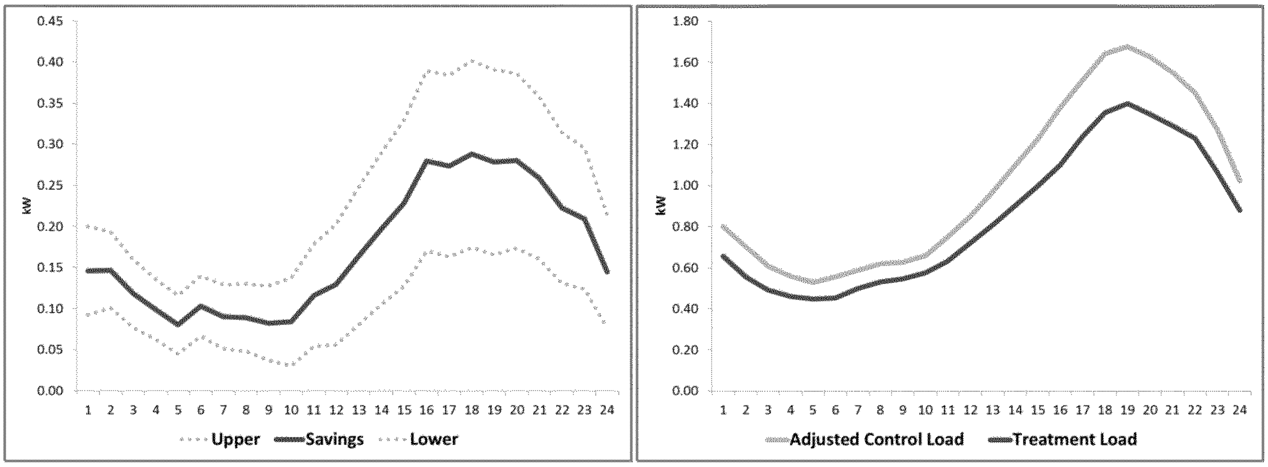
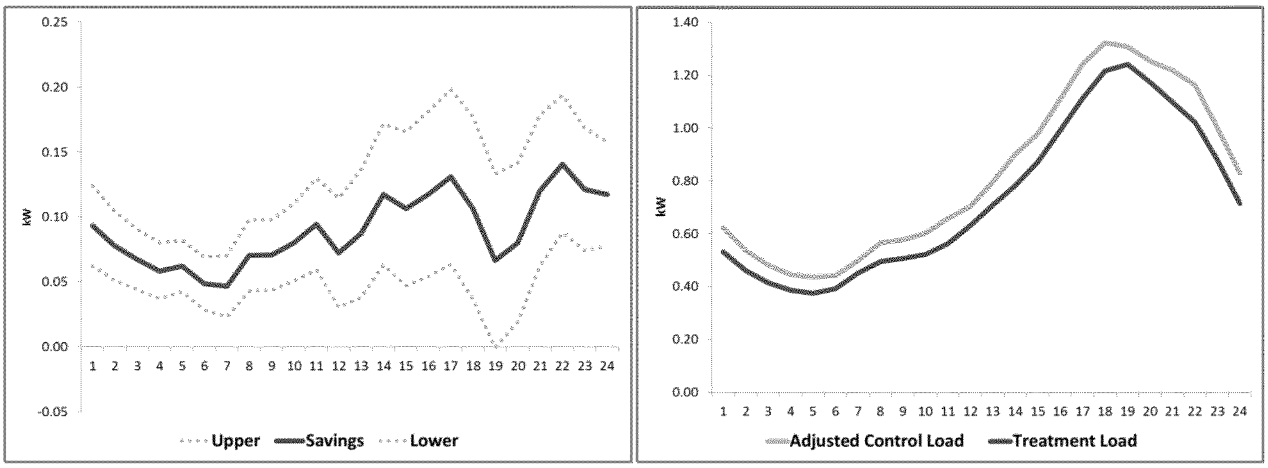


Figure 4-15 Average Per-Participant Savings: Hot Summer Day, Singly Enrolled, Email, 5 or Fewer Alerts



We do not include the load shapes for the dually enrolled participants; however they are similar to those for singly enrolled participants presented above.

EnerNOC was also interested in quantifying the segment level on-peak demand impacts on the most relevant day type—the hot summer days. We estimated these impacts by summing all of the statistically significant segment level estimates for both the dually and singly enrolled participants. We estimate the impacts in this manner because while we cannot estimate always estimate statistically significant savings at the program level because of the variation among customers, we are often able to estimate the savings at the segment level.

As with the segment level energy savings, the demand savings estimates are different from the program level estimates. This is because while we cannot always estimate statistically significant savings at the program level because of the variation among customers, we are often able to estimate the savings at the segment level. We present these estimates to provide insight into which customers are saving more or less across segments only, we use estimates in Table 4-15 above when we claim savings for the Energy Alerts program as a whole.

In Table 4-17 below, we p resent the estimated on-peak kW impacts for each Energy Alerts segment; we also indicate whether the estimate was significant, and the total recognized impact for that segment. At the bottom of the table, we sum the recognized, or significant, on -peak impacts across segments for singly and dually enrolled participants to estimate the impacts for the entire program. [31]

Table 4-17 2013 Energy Alerts Program Level On-peak Demand Savings: Hot Summer Days

Segment	Number of Participants	Average On-peak Impact (kW)	Total Estimated Impact (kW)
Singly Enrolled			
Email: Fewer than 5 Alerts	4,520	0.111	502
Email: More than 5 Alerts	12,598	NS	-
SMS: Fewer than 5 Alerts	2,508	0.238	597
SMS: More than 5 Alerts	6,789	NS	-
Total	**26,415**	**0.416**	**1,099**
Dually Enrolled			
Email: Fewer than 5 Alerts	7,493	0.227	1,701
Email: More than 5 Alerts	16,293	NS	-
SMS: Fewer than 5 Alerts	3,602	0.360	1,297
SMS: More than 5 Alerts	9,121	NS	-
Total	**36,509**	**0.082**	**2,998**

In the top half of the table we present the results for the singly enrolled participants by segment. Of the singly enrolled participants, only those that receive 5 or fewer alerts show a significant savings estimate, with a total on -peak impact of 1.1 MW. In the bottom half of the tables, we present the results for the dually enrolled participants by segment, overall the dually enrolled participants save more than those singly enrolled, both because the save more on a per -customer basis and because there are more dually enrol led participants. The total on -peak impact for the dually enrolled customers is 3.0 MW.

[31] We determined whether to consider an estimate significant based on the percentage of significant hours within each period. An estimate had to have at least three significant intervals and all intervals had to have the same sign, i.e. all positive or all negative in order to be included in the table above as significant. By doing this we are assuming that if we were to explicitly estimate confidence intervals for the on-peak period in questions, they would maintain overall significance, even though some individual hours may not be significant on their own.

KEY FINDINGS AND RECOMMENDATIONS

This chapter presents our key findings and recommendations for future program years.

5.1 KEY FINDINGS

The following were identified as key findings during the EnerNOC's Evaluation of PG&E's CWP and Energy Alerts programs.

5.1.1 Overall Findings

Overall, the total annual energy savings from both CWP and Energy Alerts are presented below in Table 5-1. As we saw in the respective program results sections, we were not able to estimate statistically significant savings for the singly enrolled CWP participants. The dually enrolled participants and singly enrolled Energy Alerts participants both show an estimated savings between 260 and 295 kWh annually. Overall for both programs, PG&E participants are saving 17,796 MWh.

Table 5-1 Total Annual Energy Savings: All Participants

Subpopulation	Number of Participants	Annual Savings (kWh per customer)	Total Savings (MWh)
Singly Enrolled CWP Participants	503,019	0	0
Singly Energy Alerts Participants	26,415	267.43	7,064
Dually Enrolled Participants	36,509	293.96	10,732
Total Energy Savings	**565,943**	**31.44**	**17,796**

Overall, the total annual demand savings from both CWP and Energy Alerts are presented below in Table 5-2. As we saw in the respective program results sections, we were not able to estimate statistically significant savings for the singly enrolled CWP participants. The dually enrolled participants and singly enrolled Energy Alerts participants both show an estimated savings between 0.045 and 0.095 kW on hot summer days. Overall for both programs, PG&E participants are saving 4.5 MW on a hot summer day.

Table 5-2 Total Annual Demand Savings: All Participants

Subpopulation	Number of Participants	Annual Savings (kWh per customer)	Total Savings (MWh)
Singly Enrolled CWP Participants	503,019	0	0
Singly Energy Alerts Participants	26,415	0.048	1,268
Dually Enrolled Participants	36,509	0.091	3,322
Total Energy Savings	**565,943**	**0.008**	**4,590**

5.1.2 Customer Web Presentment Findings

- Based on our analysis this year, it appears that singly enrolled CWP participants are not saving any energy, however, as we mentioned above in Chapter 4 we believe that our inability to detect savings may be the result of bias. Large gaps in the data may be inhibiting our matching process and preventing us from detecting savings in the CWP population.

- Dually enrolled CWP participants saved a total of 10,732 MWh during 2013, or 294 kWh per participant, for an average annual impact of 3.3% .
- Dually enrolled CWP participant have an average demand savings of 0.091 kW (or 4.3%) on a hot summer day. The dually enrolled participants achieved a demand savings of 3.3 MW in 2013.
- Dually enrolled CWP participants are saving energy; however, we believe the majority of the savings in the dually enrolled population to be attributable to Energy Alerts, vs. CWP. However, because of the bias mentioned above, we cannot be sure of this hypothesis.
- One additional hypothesis that may explain why we were unable to detect savings for the CWP participants is the very large increase in participation. This may at first sound counterintuitive, however both PG&E's marketing efforts and the redesigning the interface has made My Usage more visible has significantly increased traffic to the My Usage tab. This could result in many more customers viewing the website out of curiosity, but fewer customers actually engaging with and making modifications in behavior based on the information provided.

5.1.3 Energy Alerts Findings

- Nearly all of the savings for the Energy Alerts program is attributable to participants receiving 5 or fewer alerts in 2013.
- Savings is very comparable between singly enrolled and dually enrolled participants, with dually enrolled participants saving only slightly more, on average, than singly enrolled participants.
- Singly enrolled Energy Alerts participants saved a total of 7,064 MWh during 2013, or 267 kWh per participant, for an average annual impact of 3.0%.
- Singly enrolled Energy Alerts participants have an average demand savings of 0.048 (2.4%) on a hot summer day. The singly enrolled Energy Alerts participants achieved a demand savings of 1.3 MW in 2013.
- Dually enrolled Energy Alerts participants saved a total of 10,732 MWh during 2013, or 294 kWh per participant, for an average annual impact of 3.3% .
- Dually enrolled Energy Alerts participant have an average demand savings of 0.091 kW (or 4.3%) on a hot summer day. The dually enrolled Energy Alerts participants in total achieved a demand savings of 3.3 MW in 2013.
- The incremental effect of CWP participation for an Energy Alerts participant can be estimated at approximately 26 kWh annually, and 0.043 kW, however these estimates are so small that they fall within our typical confidence intervals, and are not likely to be statistically significant.
- We did not see any statistically significant savings for those participants that receive more than five alerts per year. We believe that this may be a result of indifference because they receive many alerts, but are still using energy in a one of the higher tiers. In many cases those with large homes, or high AC use due to location, will be unable to move out of the higher tiers, and will continue to receive alerts regardless of any changes made in the home.

5.2 RECOMMENDATIONS FOR FUTURE PROGRAM YEARS

The following were identified as recommendations for future program years:

- Because we cannot be sure w hy we were unable to detect savings for singly enrolled CWP participants, we cannot recommend making changes to the program based on the 2013 evaluation.
- We recommend looking closely at new CWP participants in 2014, when better data will be available, to determine if the program impacts are truly dropping or if bias resulting from a missing data is obscuring the savings estimates.
- Overall, given the very high participation rate for CWP, we recommend that PG&E continue to offer and enhance their customer i nterface, even if we cannot attribute savings directly to those customers.
- Energy Alerts appears to be a very successful program, however, we have not accounted for the possibility of double counting between Energy Alerts and PG&E's other conservation and Energy Efficiency programs. It is very likely that participants that are interested in Energy Alerts would also be interested in other PG&E programs, and therefore some portion of the savings we attribute to Energy Alerts is likely attributable to other p rograms.
- Given the proportion of program savings attributable to participants receiving fewer than five alerts, we would recommend marketing Energy Alerts to customers with a monthly usage that boarders tiers two and three several months out of the year. These are the participants that seem to be able to most effectively take advantage of the Energy Alerts.
- The Energy Alerts population has been fairly consistent and stable over the last three evaluation years, we would therefore conclude that Ene rgy Alerts participants are not only saving energy but getting value from the program.

About EnerNOC

EnerNOC's Utility Solutions Consulting team is part of EnerNOC's Utility Solutions, which provides a comprehensive suite of demand-side management (DSM) services to utilities and grid operators worldwide. Hundreds of utilities have leveraged our technology, our people, and our proven processes to make their energy efficiency (EE) and demand response (DR) initiatives a success. Utilities trust EnerNOC to work with them at every stage of the DSM program lifecycle – assessing market potential, designing effective programs, implementing those programs, and measuring program results.

EnerNOC's Utility Solutions deliver value to our utility clients through two separate practice areas – Implementation and Consulting.

- Our Implementation team leverages EnerNOC's deep "behind-the-meter expertise" and world-class technology platform to help utilities create and manage DR and EE programs that deliver reliable and cost-effective energy savings. We focus exclusively on the commercial and industrial (C&I) customer segments, with a track record of successful partnerships that spans more than a decade. Through a focus on high quality, measurable savings, EnerNOC has successfully delivered hundreds of thousands of MWh of energy efficiency for our utility clients, and we have thousands of MW of demand response capacity under management.
- The Consulting team provides expertise and analysis to support a broad range of utility DSM activities, including: potential assessments; end-use forecasts; integrated resource planning; EE, DR, and smart grid pilot and program design and administration; load research; technology assessments and demonstrations; evaluation, measurement and verification; and regulatory support.

The team has decades of combined experience in the utility DSM industry. The staff is comprised of professional electrical, mechanical, chemical, civil, industrial, and environmental engineers as well as economists, business planners, project managers, market researchers, load research professionals, and statisticians. Utilities view EnerNOC's experts as trusted advisors, and we work together collaboratively to make any DSM initiative a success.

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