Pacific Gas and Electric Company 2016 Program Year SmartMeter™ Program Enabled Demand Response and Energy Conservation Annual Report

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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 2016 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 2016, 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, Bill Forecast, Home and Business Energy Reports, and Home and Business Area Network (HAN), which are energy conservation initiatives based on or enhanced by 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 2016 (PY 2016) 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.09-03-026), 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 2016. These are described below:

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

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

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. In return, SmartRate™ customers receive credits on non-peak usage from June through September. A credit of $0.024 per-kWh applies to all usage other than peak-period usage on SmartRate™ event days. For all SmartRate™ customers not on E-TOU-B, an additional credit of $0.0075 per-kWh applies to usage above 100% of customers' baseline allocation, regardless of time period. For E-TOU-B customers, an additional credit of $0.005 per-kWh applies to all usage, regardless of time period. Up to fifteen SmartDays™ can be called year round during non-holiday weekdays.

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 dual enrollment 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 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

[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.

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." In July 2015, the CPUC formally adopted D. 15-07-001, which retained SmartRate with minor modifications to the participation credit structure to preserve revenue neutrality in light of the tier collapse approved in the same decision.

Approximately 25,000 customers dropped out of SmartRate™ over the period of analysis (October 2015 through September 2016), but 37,000 new customers enrolled, resulting in about 12,000 net new customers[7]. The total number of SmartRate-only customers has increased from approximately 83,000 and 89,000 in 2013 and 2014, to over 92,000 in 2015, and 111,000 in 2016. The number of dually-enrolled customers has fallen somewhat, from approximately 38,300 in 2013 and 40,300 in 2014, to about 36,600 in 2015, and 35,000 in 2016.[8,9] Twelve events were called in 2016.

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

Peak Day Pricing[10] (PDP) is a CPP overlay 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 during one of two on-peak periods: 2 PM to 6 PM or Noon 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 $0.60/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.[11] PG&E provides bill protection during the first year on PDP to encourage customers to try it without risk.[12] The defaulted large customers have the ability to stay enrolled or opt-out by choosing the rate that works best for them. At the same time in May 2010, PG&E was also required

[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 3, 2017. These figures reflect the enrollment numbers for the program for PY 2016.
[8] Since SmartAC™ is not a SmartMeter™ enabled program, only the impacts for singly enrolled SmartRate™ participants are reported in Chapter 4.
[9] PG&E submitted its load impact analysis for SmartRate™ on April 3, 2017 in R.13-09-011. The title is *2016 Load Impact Evaluation of Pacific Gas and Electric Company's Residential Time-based Pricing Programs*.
[10] 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™.
[11] 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.
[12] 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.

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.[13] 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 had at least 24 months experience on TOU rates, PG&E defaulted 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.

During 2016, most active PDP customers had been defaulted onto PDP from a pre-existing TOU rate. The PY 2016 evaluation report focused both on these defaulted customers and the customers who opted in.[14] Defaulted customers include large C&I customers, some of which enrolled in the legacy voluntary CPP program prior to the default in 2010 or were defaulted to CPP and remained on CPP even though their load dropped below 200 kW. The 2016 Load Impact study concerns the 2,018 large participating C&I default CPP customers, as well as 1,765 new small and medium business customers that opted into PDP. Additionally, the number of SMB customers who remained enrolled in 2016 was 206,786, on average.

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. In 2015 PG&E received approval to offer two new optional TOU rates for residential customers, E-TOU-A and E-TOU-B, which opened for enrollment in 2016. Customers on E-6 could remain on that rate, but it was closed to new enrollees. Customers on E-7 were defaulted to the new E-TOU-A rate, but were given the option of instead moving to E-TOU-B, E-6, or back to the standard rate (E-1), based in part on customer-specific information provided by PG&E about which rate may be most beneficial.

Thus, PG&E had three voluntary residential TOU rates available in 2016: E-6, E-TOU-A, and E-TOU-B. All three available TOU rates are seasonal, with generally higher prices in summer than in winter.[15] The E-6 tariff has three pricing periods in summer and two in winter. The summer peak period covers the six hours from 1 to 7 p.m. on weekdays, a split partial-peak is from 10 a.m. to 1 p.m. and 7 to 9 p.m. on weekdays, and 5 p.m. to 8 p.m. on weekends. All other hours are off peak. In winter, there is no peak period, and the partial-peak period applies to hours 5 to 8 p.m. on weekdays. All other hours are off peak.

The new E-TOU rates have only two pricing periods (peak and off-peak), which include the same hours during each of two seasons (summer and winter), where summer includes the months of June through September. The peak periods are 3 p.m. to 8 p.m. for E-TOU-A, which is recommended for relatively low-use customers, and 4 p.m. to 9 p.m. for E-TOU-B, which is recommended for relatively high-use customers.[16] The non-summer peak price is lower than the summer peak price.
PG&E conducted six distinct *ex-post* analyses of PG&E's non-NEM residential TOU customers:

1. Three analyses of E-1 customers who moved to a TOU rate, with separate analyses of customers who migrated to E-6, E-TOU-A, and E-TOU-B; and
2. Three analyses of E-7 customers following the closing of the rate, with separate analyses of customers who migrated to E-6, E-TOU-A, and E-TOU-B.

[13] 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
[14] *2015 Load Impact Evaluation of California's Statewide Non-residential Critical Peak Pricing Program,* Nexant: 2016.
[15] For the two new E-TOU rates, summer is defined as June through September.
[16] In 2020, the peak period hours for E-TOU-A will change to match those of E-TOU-B.

The 2016 ex post evaluation estimates impacts for 21,380 incremental E-6 customers (migrating from E-1), 21,578 incremental E-TOU-A customers (migrating from either E-1 or E-6), and 4,484 incremental E-TOU-B customers (migrating from E-1 or E-6).

As discussed in the previous section, TOU rates became mandatory for small and medium business customers starting in November 2012[17] 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 who were previously on a TOU rate for at least two years started being enrolled onto opt-out PDP. 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 has been transitioning small and medium business (SMB) and agricultural customers to mandatory TOU rates since 2012, with cohorts of approximately 225,000 SMB customers transitioned in November 2012, and 144,000 in November 2013. Similarly, cohorts of 17,500 agricultural customer accounts were transitioned in March of 2013. In November 2014 and March 2015, 61,000 SMB and 8,300 agricultural customers transitioned to TOU rates. The Load Impact study concerns customers who transitioned to TOU rates in November 2015 and March 2016, of which there were 34,244 SMB and 1,728 agricultural customers.

2.1.4 Programmable Communicating Thermostat (PCT) Program

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 the plans for a PCT direct load control program were put on hold. PCTs have not been incorporated as a mandatory measure into 2013 Title 24 and subsequently, PG&E will continue to monitor the market and assess opportunities for PCTs in load control programs.

2.1.5 Peak Time Rebate (PTR) Program

In A.10-02-028, PG&E filed a proposal for a 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[18] 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.

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. On November 1, 2013, PG&E and ORA jointly filed a Joint Motion for Leave to Withdraw PG&E's default PTR proposal. 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. On July 23, 2015 the CPUC (in D.15-07-008) dismissed PG&E's PTR application without prejudice.

[17] Effective November 1, 2014, new customers establishing service on Schedule A-1 where a Smart Meter™ is already in place will be charged Schedule A-1 TOU rates

[18] 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.

2.1.6 Real Time Pricing Rate (RTP)

This program was not approved by the CPUC and the proceeding has been closed. A brief regulatory update on the program decision is provided. 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.[19] 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." 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.

2.2 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.[20] 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. 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.

During 2016, 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.

At the end of 2016 PG&E launched a dashboard redesign provides a contemporary look and feel with improved navigation to high value tools and features.

[19] Large Commercial and Industrial Customers; Medium Business Customers; Small Business Customers; Large Agricultural Customers; Small Agricultural Customers, and; Residential Service Customers

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

A key enhancement breaks down the costs components of the bill. In addition to an annual view of energy usage, a new view now shows key cost drivers such as appliances, heating, and cooling, giving customers the ability to better manage energy costs by understanding what the bill cost drivers are.

Also, energy savings tips are now organized by theme, with better navigation, and are based on responses to the energy audit. Better organization and presentment increases likelihood of customers learning how they can save energy. Tips are automatically filtered based on the characteristics of a customer's home including:

1. home type
2. own or rent
3. heating system and type
4. type of air conditioning
5. solar customer
6. have a pool

Finally, Next Best Action is new functionality that displays personalized banners to drive customers to take appropriate actions and learn about beneficial programs and services from PG&E.

A total of 595,280 customers used the "My Usage" feature to view their interval data at least one time during the 2016 calendar year. For the purpose of the evaluation, we consider only those customers (who view their usage at least once during 2016) to be participants in CWP. In addition, 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. A significant number of the CWP participants are also dually enrolled in Energy Alerts. The impacts reported here are based on an analysis population of 498,095 singly enrolled CWP participants and 39,219 participants dually enrolled in CWP and Energy Alerts.

2.2.2 Energy Alerts and Bill Forecast 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.[21] The program allowed customers to receive advance warning via email, phone, or text message if their electricity usage was projected to move into higher pricing tiers by the end of the current billing cycle. Projected usage was calculated on the eighth day of the customer's billing cycle, and Energy Alerts were subsequently sent out to those customers whose total usage for the billing cycle was likely to enter the higher (e.g. third or fourth) pricing tiers. Energy Alerts were also sent out when the customer's usage had actually entered any of the higher pricing tiers, with a maximum of four Energy Alerts per service agreement in a billing cycle.

In March of PY 2016 Energy Alerts transitioned into Bill Forecast Alerts (BFA). BFA replaced the tier alerts with an alert that warns customers when they reach a specified dollar amount threshold. Customers can set a monthly bill alert amount of their choice. Customers are subsequently notified via email, phone, or text message when they are on pace to exceed that amount by the end of their billing cycle. BFA is only available for residential customers who are SmartMeter™ read and billed.

Customers could enroll in Energy Alerts, or currently BFA, online via the My Energy web site. During the past few years, PG&E has marketed Energy Alerts and BFA in a similar manner as CWP and often in parallel with CWP and My Energy communications. In December 2013, the My Energy homepage was redesigned, which made it easier for customers to connect to other often-used functions, such as analyzing usage, comparing rate plans, and signing up for Energy Alerts. From 2014 through 2016, there were no direct marketing efforts for Energy Alerts or BFA, but enrollments continued to

[21] PG&E implemented the program in 2010 prior to the CPUC's order to provide these services to customers under the Privacy Decision D.11.07.056.

increase, most likely due to greater customer awareness of PG&E's digital services accessible through the My Energy website.

As of December 31, 2016, there were 130,100 customers enrolled in BFA. The evaluation considers a customer enrolled in BFA if they receive one or more alerts during 2016. Of those enrolled, 78,872 were singly enrolled and 51,228 also viewed their My Usage data in 2016 and, therefore, were considered dually enrolled in BFA and CWP. 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 61,210 singly enrolled BFA participants and 39,219 participants dually enrolled in CWP and BFA.

2.2.3 Home and Business Area Network (HAN) Platform

Under the SmartMeter Upgrade filing (D.09-03-026), PG&E developed 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. The HAN pilot was carried out over three phases, each of which is described below.

In 2012, PG&E began implementing the Initial Rollout phase of its HAN platform, also referred as the Demand Response Enablement phase, pursuant to Ordering Paragraph 11 of CPUC decision 11-07-056. In this phase, 423 In-Home Displays (IHD) were installed in customer homes. 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.[22]

In mid-January of 2013, PG&E began 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. During the first year of Phase 2 rollout, PG&E was directly involved in manually loading devices to the system, pairing the devices to the customers' meters, and then enabling the devices.

Phase 3, referred to as the HAN Demand Response Integration phase, was authorized under a separate advice letter dated March 22, 2013 (Advice 4119-E-A). For eligible rates, real-time usage, pricing, messaging and DR event alerts were provided through the SmartMeter to HAN devices, presenting energy pricing over time (time-based rates) or pricing tiers (standard tiered rates). Capabilities included a daily message notifying customers of their estimated costs to date and estimated monthly bill forecast based on actual usage patterns and forecasting algorithms. Demand response event alerts were also sent to the HAN devices. During a technology assessment conducted in the summer of 2014, PG&E provided 1,700 test customers with devices; PG&E made this functionality available to all residential and small medium business customers at the end of 2014. Phase 3 was evaluated in 2014 by Nexant.[23]

The pilot is now closed. As of February 2014, the HAN device eligibility and registration process is fully automated through the My Energy web portal, which allows the platform to scale and support requests at volume. Though there is no formal program, customers may still log into My Energy, link to their Home and Business Area Network Dashboard, and can register and pair their device to the SmartMeter to receive real-time data using the self-service portal. As of December 2016, 5,631 devices had connected to the HAN platform at any time.

[22] *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.
[23] HAN Phase 3 Impact and Process Evaluation Report, Nexant, December 2014. http://www.calmac.org/publications/HAN_Impacts_and_Savings_Report_FINAL2.PDF

2.2.4 Bill Forecast Tool

The Bill Forecast tool is one of several tools made available through PG&E's online portal, known as My Energy. Residential customers with SmartMeters that are read remotely can log into My Energy, navigate to My Dashboard, and use the Bill Forecast tool. The Bill Forecast tool has two functions – an estimated bill of the energy consumed to date and a forecast of the total bill amount at the end of the current billing cycle. These estimates are based on the interval data collected by the SmartMeter.

While the Bill Forecast tool has been available since November 2011, PG&E does not actively market the tool.

2.2.5 Home and Business Energy Reports

The SmartMeter data is also used to support and enhance specific features of the Home Energy Reports (HERs) offered to residential customers. PG&E worked with Opower to begin offering Home Energy Reports to their customers in July 2011. Small and medium business customers were also offered Business Energy Reports beginning in January 2014. Printed reports are mailed to the participating service addresses approximately 6 times per year and contain similar information for both Residential and Business customers. The reports present information that allows participants to track their energy use over time, and compare their energy usage to similar homes and businesses in the area. The reports also include different tips to help participants reduce consumption.

After a year-long pilot, it was concluded that Business Energy Reports (BERs), provided to PG&E's small and medium business customers, did not generate energy savings, so the pilot was terminated.

PG&E's Home Energy Reports (HER) program mails reports on a periodic basis to customers included in the treatment groups of its series of randomized control trials (RCTs). Each report consists of two key "neighbor comparison modules" that provide recipient households with comparisons of energy use to that of similar neighbors. These "neighbor comparison" modules are included with every report. Each of these neighbor comparison modules is explained below:

1. The last 2 month-household comparison shows how recipient's energy use in the prior month compared to similar homes. This information is based on billing data.
2. The last 12-month household comparison shows how recipient's energy use in the prior twelve months compared to similar homes. This information is based on billing data.

There are other modules in the HERs as well. These modules are rotated in and out and do not appear in every report:

3. Marketing modules promoting participation in PG&E's energy efficiency programs.
4. Module that suggests energy efficient tips to increase energy savings by changing behaviors in the purchase and installation of energy-efficient equipment and in the utilization of energy at home.
5. The "Average day last month" module that shows average consumption over the course of weekdays in the prior month. This information is based on interval data. While SmartMeter™ data is not currently required for all in the modules of the reports, the modules are significantly enhanced by it.

Since only module #5 currently uses interval data and there is no separate evaluation done for module #5 (it is rotated in and out), the corresponding savings are not reported out in the table at the end of the report.

2.2.6 Customized Residential Rate Comparison Report

Following a "Test and Learn" strategy with a limited population in 2016, PG&E will begin mailing all qualified residential customers a customized rate comparison report in the fall of 2017. This report is similar to the one that is available online via Your Account and will also include behavioral tips. Approximately 2.5 million customers will receive reports, available in both print and digital versions,

beginning in the fall of 2017. The "Test and Learn" demonstrated that the customized rate comparison reports successfully raise customer awareness of rate choices and the existence of Time-of-Use rates.

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 of dollars) 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 2016, PG&E had approximately 141,000 active enrollments in SmartRate™. Of those customers, 108,539 were singly enrolled in SmartRate™ and 31,966 were dually enrolled in SmartRate™ and SmartAC™.[24] PG&E also had about 2,018 large non-residential customers and 206,786 defaulted SMB customers enrolled on the PDP tariff in 2016. In addition about 13,138 small and medium business customers were also enrolled on the PDP tariff through early enrollment campaigns in 2014 and 2015. For the PY 2016 evaluation period, there were also 85,275 non-net metered residential TOU customers and 506,105[25] 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 impact reflects the performance of the demand response events in 2016—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 evaluation reports

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

[25] This number includes all customers who are SmartMeter Billed, SmartMeter Enabled or SmartMeter Read. The vast majority are SmartMeter Billed.

for PY 2016 were filed on April 3, 2017 for each active demand response program: SmartRate™, PDP, and residential and non-residential TOU.[26,27]

For singly enrolled SmartRate participants, the load impact was 0.13 kW per customer averaged across the twelve SmartDay™ events in 2016, or a 9% reduction in per customer load. The aggregate load impact for the program was 14.0 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, small and medium defaulted customers, and the small and medium business EEG participants. The average aggregate load impact across the twelve events in 2016 was 30.7 MW for the defaulted large commercial and industrial customers. This represents a 5.2% load reduction relative to the reference load; the load impact averaged per large customer was 15.2 kW. For the 208,551 SMB customers, the average aggregate load impact across the twelve events in 2016 was 26.6 MW. This represents a 2.5% load reduction relative to the reference load; the load impact averaged per customer was 0.1 kW.

The residential TOU impacts were calculated for non-net metered customers for the analysis periods of October 2015 through September 2016 for E-6 customers and March 2016 through September 2016 for E-TOU-A and E-TOU-B customers.[28] The average aggregate peak period load reductions on monthly system peak days from June through September were 1.4 MW from 21,380 E-6 customers, 1.8 MW from 21,578 E-TOU-A customers, and 1.2 MW from 4,484 E-TOU-B customers, for a total of 4.4 MW from 47,441 customers.

Implementation of mandatory TOU rates resulted in a 1.4 MW demand reduction during the average weekday on-peak hours and a 1.6 MW demand reduction during an average monthly system peak day in 2016. In addition, the mandatory TOU rates yielded 120.83 MWh in energy savings in 2016. These impacts are for the approximately 41,000 SMB and 2,000 agricultural customers that switched to TOU rates in November 2015 and March 2016.

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 July 16, 2014 in Appendix A to the "Settlement Agreement on Marginal Cost and Revenue Allocation in Phase II of the Pacific Gas and Electric Company's General Rate Case" as part of PG&E's A13-04-012. 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 and Bill Forecast Alerts Program, Bill Forecast Tool 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 conserve energy.

The energy impacts were evaluated according to the guidelines presented in the California Energy Efficiency Evaluation Protocols.[29]

[26] *2016 Load Impact Evaluation of Pacific Gas and Electric Company's Residential Time-based Pricing Programs*, Christensen Associates: 2017.
[27] *2016 Load Impact Evaluation of California's Statewide Non-residential Critical Peak Pricing Program,* Nexant: 2017.
[28] The different period of analysis for E-TOU-A and E-TOU-B customers is attributable to the fact that the rate was first introduced in March 2016.
[29] California Energy Efficiency Evaluation Protocols, prepared for the California Public Utilities Commission, April 2006.

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 498,095 singly enrolled CWP participants, 61,210singly enrolled BFA participants, and 39,219 participants dually enrolled in CWP and BFA.

HAN service accounts are determined based on the number of devices (e.g., In-Home Displays) registered with PG&E. For the HAN Phase 1 Pilot, a total of 423 HAN devices were installed in participants' homes. For the HAN Phase 3 Pilot, a total of 1,685 customers agreed to participate, where 1,001 were recruited from the SmartRate target base, and 584 were recruited from the TOU target base. In addition to the participants being recruited through these two Pilots, there were additional residential customers who voluntarily chose to install an IHD or a Gateway device using PG&E's HAN platform. The total number of customer ever using the HAN platform as of December 31, 2016, was 5,631 (including the Pilot participants).

PG&E has conducted two trials of Business Energy Reports (BERs). Both of these trials employed a randomized control trial design whereby eligible small- and medium-sized customers were randomly assigned (by a third party) to receive the reports comparing business energy use to similar businesses (treatment group) or not (control group). The first trial involved a single vendor (Pulse, subsequently acquired by EnerNOC) and included approximately 40,000 small- and medium-size non-residential customers divided evenly into treatment and control groups. The trial began in January 2014 and concluded in October 2014. The savings evaluation was completed in early 2015 and found estimated percent reductions of 0.32% for electricity and no savings for gas.

The second trial of BERs initiated in November 2015 and concluded in September 2016. This trial tested reports by two vendors, Opower (subsequently acquired by Oracle) and EnerNOC. While each of the vendors produced unique reports designed to affect energy usage, each vendor provided content to customers was similar in inclusion of these design elements:

- A welcome report that introduces the program, provides historical energy usage, normative comparisons or goal-setting, and tips for saving energy tailored to business sectors, and
- Subsequent reports that provide personalized assessments of business energy use, customized recommendations for saving energy.

This trial involved approximately 65,000 businesses assigned to the following treatment conditions:

- Opower's treatment involving peer comparisons
- EnerNOC's goal-setting treatment
- EnerNOC's peer comparison treatment

The Home Energy Reports was first launched in August 2011 and there were seven discrete experiments launched—and currently in-field—for the Home Energy Reports program. There are approximately 1.5 million residential households who get the Home Energy Report. Roughly 10 million reports were sent over the course of 2016.

3.2.2 Energy Savings

For the CWP and Energy Alerts programs, ex post energy savings for 2016 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. AEG'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 4,334 MWh for singly enrolled BFA participants, and 1,271 MWh for dually enrolled participants. The evaluation did not find any statistically significant savings for singly enrolled CWP participants.

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 $42.66/MWh.[30]

[30] Appendix A from the Settlement Agreement on Marginal Cost and Revenue Allocation in Phase II of Pacific Gas and Electric Company's 2014 General Rate Case (c).

RESULTS

Table 1 and Table 2 provide the PY 2016 demand response and energy conservation results, respectively.

Table 1 PG&E SmartMeter™ Program Enabled Demand Response Programs Subscription Statistics: December 31, 2016

		Demand Reduction		Energy Savings		
Demand Response Program	**Service Accounts[31]**	**Aggregate Load Impact[32] (MW)**	**Financial Benefits[33] (thousands)**	**Energy Savings[34] (MWh)**	**Financial Benefits[35] (thousands)**	**Total Financial Benefits (thousands)**
Singly enrolled SmartRate™	108,539[36]	14.0[37]	$799	0	$0	$799
PDP (large C&I)	1,267[38]	19.4[39]	$1108	0	$0	$1108
PDP (SMB)	206,467	24.9	$1422	0	$0	$1422
Opt-In PDP (SMB)	1,740	1.9	$108	0	$0	$108
Residential TOU	47,441[40]	4.4[41]	$251	0	$0	$251
Non-residential TOU	42,555[42]	1.6[43]	$91	120.8[44]	$5	$96
Total	**408,009**	**66.2**	**$3,779**	**120.8**	**$5**	**$3,784**

[31] 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).
[32] Program MWs equal the sum of each enrolled participant's interruptible/curtailable load.
[33] 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 Appendix A of the Settlement agreement on marginal Cost and Revenue Allocation in Phase II of Pacific Gas and Electric Company's 2014 general Rate Case (A.13-04-012).
[34] Energy savings will be calculated based on the results of the Annual Load Impact Analysis for each program.
[35] Financial benefits = energy savings (kWh) x avoided generation energy costs (in thousands of dollars).
[36] 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.
[37] The aggregate load impact represents the average load reduction during the event period across all event days during the season.
[38] The PDP customer counts and impacts reported here exclude accounts that do not have SmartMeters.
[39] The aggregate load impact represents the average load reduction during the event period across all event days during the season.
[40] The number includes impacts from incremental, non-net metered, E-6, E-TOU-A, and E-TOU-B accounts on monthly system peak days during the residential TOU summer months (June through September). The average enrollment over the course of the analysis period is provided.
[41] The aggregate load impact is the average load reduction on monthly system peak days during the summer months (May through October).
[42] The number represents the accounts with SmartMeters™ that transitioned to mandatory TOU rates from November 2015 onwards. This enrollment number and the impacts reported in this table exclude those customers who defaulted prior to November 2015 or who had been on non-residential TOU rates before the SmartMeter™ deployment.
[43] The aggregate load impact of represents the average load reduction on monthly system peak days during the non-residential TOU summer months (May through October).
[44] The value represents the 2016 annual energy savings for non-residential customers with SmartMeters™ who transitioned to a TOU rate from November 2015 onwards. 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, 2016

Energy Conservation Program	Service Accounts	Energy Savings		Demand Reduction		Total Financial Benefits (thousands)
		Energy Savings (MWh)	Financial Benefits[45] (thousands)	Load Impacts[46] (MW)	Financial Benefits[47] (thousands)	
Singly enrolled CWP	498,095[48]	0	$0	0	$ 0	$0
Singly enrolled BFA	61,210[49]	6,868	$293	0	$0	$293
Dually enrolled CWP and BFA	39,219[50]	2,349	$100	0	$0	$100
Total	**598,524**	**9,217**	**$393**	**0**	**$0**	**$393**

[45] Financial benefits = energy savings (kWh) x avoided generation energy costs (in thousands of dollars). The avoided generation energy cost used in the calculation in Table II above is $42.66/MWh. This cost figure comes from Appendix A of the Settlement agreement on marginal Cost and Revenue Allocation in Phase II of Pacific Gas and Electric Company's 2014 general Rate Case (A.13-04-012).

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

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

[48] Number of Customer Web Presentment service accounts will be calculated based on number of customer sign-ups for access to interval data on PG&E's web site. 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. The actual population of CWP customers who viewed the My Usage webpage in 2016 was 595,280. Of these, 544,052 were singly enrolled in CWP.

[49] Number of Bill Forecast Alerts Program service accounts will be determined by the number of program enrollments. 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. The actual population of BFA customers in 2016 was 130,100; of those, 78,872 were singly enrolled in BFA.

[50] 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 was51,228 in 2016.

ATTACHMENT **A**

PACIFIC GAS AND ELECTRIC COMPANY'S SMARTMETER™ ENABLED PROGRAMS: PROGRAM YEAR 2016 EVALUATION OF CUSTOMER WEB PRESENTMENT AND BILL FORECAST ALERT