Smart Thermostats

CALIFORNIA
TECHNICAL FORUM

PG&E, SCE, SCG, SDG&E

MAY, 2015

CALIFORNIA
TECHNICAL FORUM

Objective: Seeking TF feedback on data analysis approach to estimate EE savings opportunity

- Measure Description

- IOU Data Overview

- IOU Data Analysis Benefits and Challenges

- Feedback requested from the Cal TF

Measure Description

Base Case	Measure Case
Programmable thermostat	Smart thermostat

Base Case

Programmable thermostat
- Weekly Schedule

Measure Case

Smart thermostat
- Geo-fencing
- Optimization Algorithm
- Occupancy Sensing
- Internet enabled (Wi-Fi, broadband)

Overview of Data Analysis Approaches

- ## Utility bill analysis
  - ❏ Comparison of utility bills for utility program participants, pre- and post- smart thermostat installation

- ## Randomized Control Trial (RCT)
  - ❏ Utility billing analysis of treatment and control groups

- ## Propensity matching
  - ❏ Utility bill comparison based on matched customers: those using smart thermostats vs those not using smart thermostats, matched based on usage profiles

PG&E Data Overview

- EE workpaper completion target date of Q4 2016

Data Characteristics	Description
Sample selection – ET Project	Recruitment under the guise of survey via email targeting customer segmentation information (persona) who meet requirements (e.g. SFH, climate zones 11-13, central AC, dual fuel)
Sample size	3,000 total (1,000 for each participating manufacturer)
Manufacturers	Nest, EcoBee, PCT(RTA CT50)/EnergyHub
Methodology	Randomized Control Trial (RCT), Billing/usage analysis Manufacturer operational data analysis 12 month prior usage data
Timing (data collection, analysis)	Data available by Q3, analysis ready Q4 2016
Statistical Confidence	High statistical confidence 90/10

- Benefits
  - ❑ Preferred methodology according to CPUC
  - ❑ High statistical confidence
  - ❑ Evaluating three different manufacturers

- Challenges
  - ❑ Expensive approach
  - ❑ Duration - results are available in 12-18 months
  - ❑ Focused on only three climate zones

- CPUC Feedback
  - ❑ Supportive of experimental design

SCE Data Overview

- EE workpaper completion target date of Q3 2015

Data Characteristics	Description
Sample selection – DR Program	Nest/EnergyHub reached out to their existing and new install base with an offer to join DR program; 10%+ signup rate. Limited to SCE bundled residential customers in SCE's service territory (all climate zones)
Sample size	Dependent on 2015 DR summer program, target 6,000 • 2013 study had 2,800 customers • 2014 study had 3,200 customers <-- Adjusted 2015 contract to include sharing of pairing date (when device was installed) • 2015 Program targeting prior year(s) participants and new
Manufacturers	90% Nest + PCT/EnergyHub + others
Methodology	Pre and post interval usage data analysis triggered on pairing date of thermostat. Partnering with SCG on their WP effort to include EE on gas and electric
Timing (data collection, analysis)	Preliminary analysis targeted for Q3 2015, final analysis Q4 2015
Statistical Confidence	High statistical significance (approximate level, eg 85%)

- Benefits
  - Cost-effective (leveraging existing BYOD customer base for analysis)
  - High statistical confidence
  - Short timeline leveraging 2 years of study data (results in Q3 2015)
- Challenges
  - Uncertainty about sample size (subject to 2015 summer DR program recruitment) (SCE is targeting 6,000 total enrollments in 2015)
  - Matching is challenging – As customers enroll, we will match them up against prior year enrollments and focus on those that have participated previously. Based on the pairing date, we will have interval usage data going back in some cases to 2013 to use in our analysis
  - Variability of install dates – SCE may have to limit customer data analysis based on pairing date. Customers who are new to SCE's service territory may not have significant interval usage data needed for analysis
- CPUC Feedback
  - SCE plans to review interval usage data analysis with the CPUC/ED to ensure we are in alignment on results

SCG Data Overview

- EE workpaper completion target date of Q3 2015

Data Characteristics	Description
Sample selection – EE Pilot	Direct mail and email outreach to SF customers with Central AC excluding special territories. Customers are offered thermostat free of charge $350 value ($200 for thermostat and $150 for installation)
Sample size	500 + 350 control group - all with advanced meters Multiple CZ, mostly the greater Los Angeles area (Inland Empire, Riverside, Central LA, Pasadena, Burbank, Glendale, etc.) Focused in customers with 20 - 80 therm/yr consumption
Manufacturers	Nest
Methodology	Randomized control trial (RCT), Billing/usage analysis. 18 months with thermostat + 12 months before installation Gas + Electric (Jointly with SCE & municipal utilities)
Timing (data collection, analysis)	Data collection is being wrapped up. Expected report completed in early Q3 2015
Statistical Confidence	High statistical significance (requires a large sample size to detect small savings) (can't say the statistical confidence level at this time)

- Benefits
  - ❑ Preferred methodology according to CPUC
  - ❑ High statistical confidence
  - ❑ Short timeline (results in Q2 2015)

- Challenges
  - ❑ Single manufacturer – plan to include all available products in WP
  - ❑ Identifying contributing specs/features to savings
  - ❑ Focus on gas savings, electrical data comes from different sources and might be difficult to analyze – SCE joined after the pilot launched. Cities are providing electrical data to SCG.

- CPUC Feedback
  - ❑ Notified about the pilot before launch, but no specific guidance received

SDG&E Data Overview

- EE program under consideration

Data Characteristics	Description
Sample selection – DR Program	Direct mail followed up with email outreach to customers identified by disaggregation software with potentially high HVAC usage Building types - Asm, EPr, ESe, Htl, Mtl, RtS. Climate zones- 7, 10, 14, & 15 (DR workpaper by KW Engineering)
Sample size	~15,000 total 40% RES/60% COM (6,5K RES as of Jan 2015)
Manufacturers	EcoBee Si
Methodology	DR focused, possibly include EE analysis, Billing/usage analysis. DR EM&V impact study filing Apr 2015. Will not use manufacturer operational data.
Timing (data collection, analysis)	Data collection completion anticipated Q3 – Q4 2015, data analysis completion anticipated Q1 2016.
Statistical Confidence	Statistical significance level ~ 75 - 80 %.

- Benefits
  - Large dataset
  - Existing installation
  - Possibly short timeline

- Challenges
  - Single manufacturer for existing data, multiple manufacturers considered for 2015 by Q3
  - Matching is challenging

- CPUC Feedback on DR WP
  - RES EE savings negative
  - NR EE savings baseline + GSA 25% multiplier

Other Supporting Information

Cal TF staff is in the process of gathering relevant information to share with the Cal TF

- ❑ Other jurisdictional EE activities across country
- ❑ Impact evaluations
- ❑ Other studies/findings

Feedback Requested from the Cal TF

- What data analysis approach is best given the available data?
  - ❑ Randomized control trial, propensity score matching, billing/usage analysis
  - ❑ Short term vs. long term savings estimate
- Do individual devices need to be tested to develop a broad set of technical specs and savings estimates?
  - ❑ Testing – lab vs. field
  - ❑ Obtaining algorithms from manufacturers or patents
- Should studies from jurisdictions outside CA be considered?
- Is further data analysis required for a long term workpaper?
- Can a statewide workpaper be developed?
- Is a distinct value needed for each climate zone using experimental data?
- Recommended next steps on statewide WP
  - ❑ Interim workpaper using billing analysis / propensity score matching
  - ❑ Revised workpaper using RCT approach
  - ❑ Aggregate climate zones (warm and cool)