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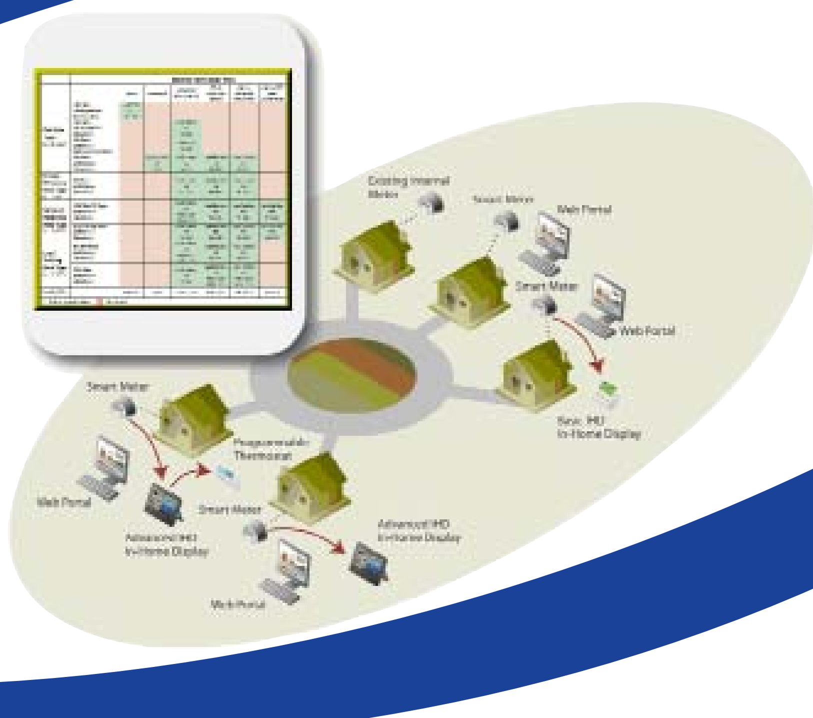
The Effect on Electricity Consumption of the Commonwealth Edison Customer Application Program: Phase 2 Supplemental Information



The Effect on Electricity Consumption of the Commonwealth Edison Customer Application Program: Phase 2 Supplemental Information

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NOTE

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Product Description

This report provides appendices that support EPRI report 1023644, which describes the Phase 2 (final) analysis of residential customers' response to Commonwealth Edison's Customer Application Program (CAP). The report contains technical materials that describe in detail the methods employed in conducting the Phase 2 analysis and presents the results of the application of additional data and methods in Phase 2.

Background

The Phase 2 analysis of the CAP extends the methods and updates the results of the earlier analysis documented in the Phase 1 report (1022703) and Phase 1 appendices (1022761). It addresses an important part of determining how the Smart Grid can best facilitate demand response motivated by residential pricing structures. The report is part of a series of studies contributed by the Electric Power Research Institute (EPRI) to help the power industry exploit technological advances to increase reliability and reduce costs while adapting to increased environmental constraints on the ways that the industry provides its services to customers.

Objectives

Demand response is becoming increasingly important as an adaptation to the rising costs of building new generation plants, siting new transmission and distribution facilities, and dealing with a host of environmental issues, notably including climate change. Improvements in communications and controls reduce costs and extend the range of potentially responsive loads. Many regulators are pressing utilities to fully utilize a range of demand response solutions. An analysis of the efficacy of Smart Grid technologies in facilitating demand response is essential to determining how these technologies should be used.

Approach

This report describes the methods by which EPRI researchers are evaluating the efficacy of Smart Grid technologies in providing demand response to Commonwealth Edison, and provides the results from this evaluation.

Results

The main purpose of the analysis described in these appendices and the associated report is to determine the extent to which residential customers' consumption of electricity is affected by various combinations of innovative rate design and Smart Grid enabling technologies. This report serves as a technical document that supports the Phase 2 final analyses presented in EPRI report 1023644. It describes the model and methods that were deployed to test the hypotheses (described in detail in EPRI report 1022266) established to guide the development and evaluation of the CAP.

Applications, Value, and Use

The wide range of issues addressed in the CAP required the use of several methods to test hypotheses and produce data that characterize how customers responded to the applications that were administered. The Phase 1 analysis, which was conducted in the late fall of 2010, utilized metered and other CAP program data for the months June–August 2010. Because that period was designed for implementing high prices for critical peak pricing (CPP), peak-time rebate (PTR), and real-time pricing (RTP), it focused on quantifying impacts for these three dynamic rate options. Accordingly, the most relevant elements of this report are those that discuss how CAP participants reacted to those prices, and the corresponding results of their applications. Additional applications were also tested in Phase 1 and confirmed or furthered in the Phase 2 analysis utilizing data through the end of the experiment in May of 2011.

Keywords

Advanced metering infrastructure (AMI)
Alternative electricity price structures
Critical peak pricing
Peak-time rebates
Real-time pricing
Opt-in and opt-out

Abstract

Based on the analysis plan described in detail elsewhere, these appendices support the accompanying report on the findings of EPRI's evaluation of the various impacts attributable to Commonwealth Edison's Customer Application Program (CAP) pilot. The overall objective of the evaluation is to determine the effects on customers' energy consumption patterns of various rate treatments, behavioral factors, and enabling technology applications. Many of the anticipated CAP effects are addressed in a series of hypotheses, derived from the CAP design, regarding the effects of the various rate, technology, and education treatments featured in the pilot. These findings complete Phase 2 of the evaluation, and they are based on an analysis of data for the entire duration of the CAP pilot (June 2010 through April 2011). The findings support some of the hypotheses and do not support other hypotheses. Phase 2 of the analysis is based on participants' electricity consumption and price data for the entire year of the CAP pilot, as well as data collected through a survey of CAP participants.

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Appendix A: Details of the Cap Hypothesis Tests

EPRI and ComEd established a set of 47 hypotheses to guide the CAP analysis. The purpose of the hypotheses, numbered from H1 through H7w and grouped according to topic, was to construct concise statements of what quantifiable effects might be expected from the CAP applications.

This appendix is organized into sub-sections corresponding to each topic. For each sub-section each hypothesis is stated, the analytical method used to test the hypothesis is discussed, and results of the hypothesis test are summarized. In instances where hypotheses could not be tested, an explanation of data issues hindering the analysis is provided. Hypotheses that require the use of electricity consumption data are separated into summer (June 11, 2010 through September 30, 2010, excluding August 3, 2010) and non-summer (October 2, 2010 through April 27, 2011) time periods, and the results are presented separately.[1]

Throughout the discussion in this appendix, we make numerous references to specific treatment cells that contain the groups of customers whose behavior relates to the hypotheses being tested. These cells are referenced by the alpha-numeric IDs found in Figure A-1 below.[2] These IDs are descriptive of the experimental design in terms of rate and enabling technology treatments. In the tables in this appendix, many of these treatments are further identified with variable names, which are defined in Section 8 of the Phase 2 report.[3]

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[1] The data indicate an outage for customers in only some of the rate treatments on August 3, 2010, and as such, this date is omitted from the summer ANOVA analyses. This was likely due to a technical error in data collection rather than an actual outage.

[2] See also; *The Effect on Electricity Consumption of the Commonwealth Edison Customer Application Program: Phase 2 Final Analysis*. EPRI, Palo Alto, CA: 2011. 1023644.

[3] See p. 8-1 of EPRI 1023644.

		Enabling Technology Type					
		None	**Removed**	**Enhanced Web (eWeb)**	**eWeb+ Basic IHD (BIHD)**	**eWeb+ Advanced IHD (AIHD)**	**eWeb+PCT /IHD (AIHD/PCT)**
Flat Rate Type N = 1,650	**Flat Rate Existing Meter No Education**	Control F1 N=450					
	Flat Rate Existing Meter Education			Application F2 N=225			
	Flat Rate AMI Meter Basic AMI Education			Control F3 N=225			
	Flat Rate AMI Meter Education		Application F4 N=0	Application F5 N=225	**Application F6 N=300**	Application F7 N=225	
Energy Efficiency Rate Type N = 750	**IBR Rate AMI Meter Education**			Application E1 N=225	**Application E2 N=300**	Application E3 N=225	
Demand Response Rate Type N = 3,525	**CPP/DA-RTP Rate AMI Meter Education**			**Application D1 N(a)=525 N(b)=225**	**Application D2 N=525**	**Application D3 N=525**	**Application D4 N=525**
	PTR/DA-RTP Rate AMI Meter Education			Application D5 N=225	**Application D6 N=525**	Application D7 N=225	Application D8 N=225
Load Shifting Rate Type N = 2,625	**DA-RTP Rate AMI Meter Education**			Application L1 N(a)=225 N(b)=225	**Application L2 N=525**	Application L3 N=225	
	TOU Rate AMI Meter Education			Application L4 N=225	**Application L5 N(a)=525 N(b)=225**	Application L6 N(a)=225 N(b)=225	
N = 8,550		N = 450	N = 0	N = 2,550	N = 2,925	N = 1,875	N = 750
	Primary Application		Not Used				

Figure A-2
Applications by Rate Type and Enabling Technology

The Main Model

The models used to analyze hypotheses H2b, H2c, and H2d form the foundation for analyzing several subsequent hypotheses. Therefore, throughout this appendix, the models presented for hypotheses H2b, H2c, and H2d will be referred to collectively as the *main model*. The main model is an ordinary least squares (OLS) linear regression containing 13 independent variables (plus a constant term) that represent different rates, experimental treatments, and customer housing characteristics.[4] Depending upon the measure of usage that is to be tested by the hypothesis, the model uses one of four dependent variables:

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[4] As used throughout this document, ANOVA generally includes analyses of variance and covariance, and may be undertaken using standard protocols or through an equivalent regression-based approach.

1. Average kWh usage during all hours (referred to as “All Hours” in results tables);
2. Average kWh usage during peak hours, 1:00 to 5:00 p.m. on non-holiday weekdays (referred to as “Peak Hours” in results tables)
3. Average kWh usage during peak hours, 1:00 to 5:00 p.m. on event days (referred to as “Event Hours” in results tables); and
4. Average kWh usage during peak hours divided by average hourly kW usage during off-peak hours for non-holiday weekdays (i.e., peak to off-peak ratios, referred to as “P/O Ratios” in results tables).

Each of these “four main measures” of usage is calculated over two separate timeframes covering the data available in the Measurement and Validation Database (MVBD):

1. The summer timeframe includes June 11, 2010 through September 30, 2010 (excluding August 3, 2010); and
2. The non-summer timeframe includes October 2, 2010 through April 27, 2011.

Because no events took place between October 2010 and April 2011, non-summer models are not specified using the Event Hours measure of usage.

The main model is most frequently used to analyze hypotheses claiming that a particular treatment “*will achieve greater energy efficiency, demand response, and load-shifting benefits than*” than another treatment, which could be viewed as joint hypotheses related to the four main measures of electricity consumption discussed above. However, rather than treat the joint nature of these hypotheses directly, we specify four summer regression models and three non-summer regression models, where each model uses one of the four main measures of usage to address a portion of the hypothesis:

1. The All Hours model addresses greater energy efficiency.
2. The Peak Hours and Event Hours models address demand response.
3. The P/O Ratio model addresses load shifting benefits.

The independent variables in the main model can also be rearranged or augmented to suit the particular hypothesis at issue. For instance, the treatment categories *not* shown in the results table identify the control group for each model. The control group in the main model is made up of customers on the flat rate (FLR) with eWeb technology and basic education (i.e. treatment cell F3) residing in a single-family home with non-space heating (SFNS). However, if a hypothesis is meant to compare the effects of, say, a basic in-home device (BIHD) relative to other technologies, then the independent variables in the model can be changed so that FLR customers with BIHDs (i.e. treatment cell F6) residing in SFNS homes make up the control group. Further, independent variables can be added to the model to measure additional treatment effects.

Throughout this appendix, coefficient estimates appear in bold if they are statistically significant at the 5% level.

Meter Type

H1: Meter type has no effect on electricity usage behaviors.

This hypothesis is designed to isolate the effect of the installation of an AMI meter. To conduct the test, it would have been necessary to compare usage between customers in cell F2 (who have standard meters) and customers in group F5 (who have AMI meters). Unfortunately, as explained in the Phase 1 and Phase 2 reports, customers in groups F2 and F5 are not drawn from the same geographic region at the same time. During an initial examination of the data, it became apparent that the two groups represent very different populations. Thus, we are unable to test this hypothesis.

Rate Treatments

The hypothesis tests related to the rate treatments are based upon comparisons of means of the data across the various treatment and control groups. The models are designed to test differences in the several measures of usage (e.g., average hourly usage) as a function of indicator variables that encompass the full range of treatment and control characteristics, including:

- Each rate treatment;
- Each technology treatment;
- Whether or not the customer was notified of bill protection;
- Whether the customer was offered the opportunity to purchase technology or was given the technology for free;
- Whether the customer received only basic AMI education or received the full education; and
- The type of housing unit each customer resides in, categorized in combinations of single or multi-family (SF or MF) units and space heat or non-space heat (SH or NS) usage.

These models facilitate comparisons between treatment and control groups and also between different treatment groups.

H2a: The IBR rate is most easily adopted by customers.

Ease of adoption is measured by the rates at which customers do not opt out of the CAP program anytime over the test year (i.e. stay enrolled). A logistic regression model, in which the dependent variable takes on a value of unity if the customer opted out, and zero otherwise, is used to predict differences in opt-out rates for each of the rate treatments.

Table A-1contains the results of this estimated model, in which the independent variables are indicator (dummy) variables for the rate treatments, technology, bill protection, education, housing type, and purchase characteristics. The estimated coefficients from these types of models can be used to simulate the probability that a customer with a particular set of treatments will opt out of the pilot. The constant coefficient indicates that customers on the IBR rate, with no technology, in a single-family home with non-space heating, and who were not notified of bill protection, have a 0.38% probability of opting out of the pilot.[5] For the other rate treatments, the probability of opting out is derived from the sum of the constant coefficient plus the coefficient for the dummy variable associated with that rate and/or other treatment. For example, the probability of opting out increases to 3.77% for a customer on the CPP rate.[6] Note that the z-statistic of 3.93 on the CPP coefficient indicates that the difference in the probability of opting out for CPP customers compared with IBR customers is statistically significant.[7]

Based on these results, the statistically significant positive coefficients for the three dynamic rate treatments support the hypothesis that the IBR customer opt-out at rate is significantly lower than that of customers on all other rates, except for those on the flat rate. Since the absolute value of the z-statistic for the coefficient on the dummy variable associated with flat rate is well below the critical value of 2.0, the probability of customers in the flat rate treatment not opting out of the pilot is not significantly different from the probability that customers in the IBR treatment opt out.[8]

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[5] For this customer type, based upon the -5.578 coefficient, the equation for calculating the probability of opt-out is exp(-5.578)/[1+exp(-5.578)].

[6] 3.77% equals exp(-5.578+2.337)/[1+exp(-5.578+2.337)].

[7] For a coefficient to be statistically different from zero at the 5% level of significance, the z-statistic must be greater than 2.0 in absolute value.

[8] Very similar results were found for an alternate specification that included only the rate dummies.

Table A-1
Impacts of Rate Type on Opt Outs[9]

Variable	Coef.	(S.E.)	z	Prob
Constant	**-5.578**	(0.611)	-9.12	0.38%
CPP	**2.337**	(0.594)	3.93	3.77%
RTP-DA	**1.532**	(0.624)	2.46	1.72%
FLR	-0.318	(0.916)	-0.35	0.27%
PTR	**1.860**	(0.611)	3.05	2.37%
TOU	**1.713**	(0.620)	2.76	2.05%
BIHD	**0.486**	(0.233)	2.09	0.61%
AIHD	0.098	(0.268)	0.37	0.42%
PCT	0.096	(0.304)	0.31	0.41%
Bill Protection	0.293	(0.364)	0.80	0.50%
Purchase	0.117	(0.385)	0.30	0.42%
Educ./Notif.	(omitted)			
SFSH	0.447	(1.006)	0.44	0.59%
MFNS	-0.360	(0.185)	-1.94	0.26%
MFSH	0.471	(0.437)	1.08	0.60%
Observations	6,434			
R-squared	0.0439			

H2b: The IBR rate causes the greatest reduction in overall electricity usage during the year.

As described in Section 4 of the Phase 2 report, because customers selected for the IBR treatment had to have at least five years of billing history, customers with lower usage are seriously under-represented in the IBR treatment. For this reason, it was not possible to make meaningful comparisons of the impacts on usage between customers on the IBR rate with those on the other rates. However, it is still important to understand differences in the impacts of the other rate treatments on electricity usage. Therefore, the test is redesigned to compare the impacts on usage among all the other rate treatments, and the tests are performed using the main model. As discussed above, the independent variables in the summer and non-summer regression equations account for the rate treatments and the treatments reflecting availability of different enabling technologies. The excluded categories define the control group.

[9] The dependent variable is a binary choice variable that equal one if the customer opted out of the pilot program and zero otherwise. See Appendix B for additional details.

Table A-2 displays the results for the test of this modified hypothesis H2b. In this table, the constant term indicates overall usage (in units of average kWh per hour) for customers associated with all of the omitted categories (i.e., those customers on the flat rate with no enabling technology, no information about bill protection, no technology offered for purchase, SFNS housing, and "basic" education). To calculate average usage for customers in other treatments, one need only sum the constant term and the coefficient for the dummy variable for that other treatment.

Put somewhat differently, each coefficient represents the difference in overall average usage (relative to the omitted category) due to the treatment. For example, because of the positive coefficient in the summer model, customers on the CPP rate use 0.044 kWh per hour more electricity than do flat rate customers during the summer period. Similarly, because of the positive coefficient in the non-summer model, customers on the PTR rate use 0.035 kWh per hour more electricity than do flat rate customers in the non-summer period. Neither coefficient is significantly different than zero at the 95% confidence level. The negative and statistically significant coefficients on the multi-family housing unit variables (MFNS and MFSH) in the summer model suggest that customers in multi-family residences use less electricity than customers in single-family residences with non-space heating in the summer period. In the non-summer model, both types of space heating residences (MFSH and SFSH) have positive and significant coefficients confirming expectations that space-heating customers would use more electricity in the non-summer months than non-space-heating customers.

As suggested in the Phase 2 report, these results reinforce the key finding from other analyses of the aggregate data. That is, when testing for treatment effects at the group level, there appears to be no significant differences on average in overall electricity usage among customers on the alternative rates.

Table A-2
Impacts of Rate Type on Electricity Usage[10]

	Summer	Non-Summer
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.377**	**0.934**
	(0.047)	(0.036)
CPP	0.044	0.037
	(0.033)	(0.027)
DA-RTP	0.063	0.024
	(0.036)	(0.030)
PTR	0.061	0.035
	(0.037)	(0.029)
TOU	0.069	0.025
	(0.037)	(0.030)
BIHD	-0.007	0.003
	(0.024)	(0.019)
AIHD	0.037	0.014
	(0.027)	(0.021)
PCT	0.014	-0.016
	(0.035)	(0.026)
Bill Protection	0.024	0.043
	(0.041)	(0.037)
Purchase Tech.	-0.055	-0.048
	(0.044)	(0.033)
Educ./Notif.	-0.077	-0.046
	(0.057)	(0.045)
SFSH	0.061	**1.399**
	(0.164)	(0.410)
MFNS	**-0.682**	**-0.441**
	(0.016)	(0.013)
MFSH	**-0.695**	**0.493**
	(0.038)	(0.071)
Observations	5,778	5,471
R-squared	0.191	0.173

[10] The dependent variable is average hourly kW usage for all days in the summer period (June through September 2010) and non-summer period (October 2010 through April 2011). See Appendix B for additional details.

H2c: The CPP rate causes the greatest reduction in peak load during the summer.

This hypothesis is tested using the main model where the dependent variable is each customer's average kWh usage during the peak period (1:00 p.m. to 5:00 p.m.) on non-holiday weekdays during the summer or non-summer time period. As in the regressions above, the independent variables account for the several rate and technology treatments. Two alternative tests of this hypothesis are developed, one in which average kWh usage is calculated for all peak hours during the summer or non-summer time period (Peak Hours); and a second in which average kWh usage is calculated for peak hours on CPP/PTR event days which only took place in the summer period (Event Hours). The hypothesis is that: a) the coefficient for CPP is negative; and b) the coefficient for CPP is more negative than those of the other rates.

Table A-3 contains the results of this test. Again the IBR customers are not included in the sample. The treatment categories not appearing individually in the table define the control group, which, in this case, is comprised of customers on the flat rate (FLR) with eWeb technology and basic education (i.e. treatment cell F3) residing in single-family homes with non-space heating. The coefficients represent the differences in average peak-period (on all days and on event days, respectively) usage for the treatments versus customers in the excluded categories. For example, in Table A-3, the summer model coefficient on CPP of 0.059 indicates that CPP customers use an average of 0.059 kWh per hour more than flat rate customers (all else equal) during peak hours, although this difference is not statistically significant. Across the three models there are only two significant differences in consumption by rate treatment: the day-ahead RTP group (DA-RTP) has higher peak consumption (on all days) in the summer than does the flat rate group; and the CPP group has higher peak consumption in the non-summer period than the flat rate group. Otherwise, there are no significant effects resulting from the various treatments.[11] Therefore, hypothesis H2c is not supported by the evidence.

[11] The statistically significant effect of Educ./Notif. during event hours is discussed in Section 5 of EPRI 1023644.

Table A-3
Impacts of Rate Type on Summer Peak Load[12]

	Summer Peak Hours	Summer Event Hours	Non-summer Peak Hours
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.563**	**2.232**	**0.845**
	(0.059)	(0.091)	(0.034)
CPP	0.059	0.002	**0.054**
	(0.041)	(0.058)	(0.026)
DA-RTP	**0.101**	0.102	0.036
	(0.045)	(0.064)	(0.028)
PTR	0.082	0.080	0.050
	(0.046)	(0.064)	(0.028)
TOU	0.063	0.071	0.017
	(0.046)	(0.065)	(0.029)
BIHD	0.005	0.016	0.005
	(0.031)	(0.042)	(0.019)
AIHD	0.059	0.087	0.016
	(0.035)	(0.048)	(0.021)
PCT	0.001	0.012	-0.025
	(0.041)	(0.058)	(0.025)
Bill Protection	0.041	0.077	0.040
	(0.052)	(0.073)	(0.036)
Purchase Tech.	-0.056	-0.081	-0.043
	(0.055)	(0.076)	(0.033)
Educ./Notif.	-0.107	**-0.223**	-0.031
	(0.071)	(0.106)	(0.043)
SFSH	0.083	-0.086	**1.38**
	(0.214)	(0.264)	(0.401)
MFNS	**-0.87**	**-1.232**	**-0.414**
	(0.020)	(0.028)	(0.012)
MFSH	**-0.846**	**-1.202**	**0.435**
	(0.047)	(0.068)	(0.073)
Observations	5,778	5,778	5,471
R-squared	0.195	0.199	0.162

[12] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

H2d: The CPP rate causes flatter load shapes at all times during the year.

This hypothesis is tested using the main model where the dependent variable is customers' average ratio of peak to off-peak usage (P/O Ratio).[13] These ratios of peak to off-peak usage are calculated over each of the summer and non-summer timeframes. The independent variables account for the rate and technology treatments. The hypothesis is that: a) the coefficient for the CPP variable is negative; and b) the coefficient for the CPP variable is more negative than those of the other rates.

Table A-4 shows that, with only two exceptions, peak to off-peak usage ratios do not vary significantly among customer groups. The first exception is that customers in the DA-RTP group are estimated to have higher summer peak to off-peak load ratios than customers on the flat rate, where the difference is statistically significant at the 5% level. The second exception is that customers living in multi-family residences with non-space heating (MFNS) have significantly flatter summer load shapes than customers living in single-family residences with non-space heating (all else equal). Otherwise, there are no significant effects resulting from the various treatments. Therefore, hypothesis H2d is not supported by the evidence.

[13] As mentioned above, the peak period is defined to include the hours 1 p.m. to 5 p.m. on non-holiday weekdays and the off-peak period includes all other hours.

Table A-4
Impacts of Rate Type on Peak to Off-Peak Load Ratios[14]

	Summer	Non-Summer
Variable	Coef. (S.E.)	Coef. (S.E.)
Constant	**1.119**	**0.904**
	(0.022)	(0.015)
CPP	0.003	0.016
	(0.014)	(0.011)
DA-RTP	**0.037**	0.017
	(0.016)	(0.012)
PTR	0.007	0.022
	(0.015)	(0.012)
TOU	-0.016	-0.018
	(0.015)	(0.012)
BIHD	0.012	0.006
	(0.011)	(0.008)
AIHD	0.019	0.010
	(0.012)	(0.009)
PCT	0.003	-0.000
	(0.015)	(0.011)
Bill Protection	0.030	0.005
	(0.018)	(0.013)
Purchase Tech.	0.001	-0.006
	(0.018)	(0.013)
Educ./Notif.	-0.009	0.022
	(0.026)	(0.018)
SFSH	0.032	0.053
	(0.069)	(0.043)
MFNS	**-0.153**	-0.001
	(0.008)	(0.007)
MFSH	-0.058	-0.014
	(0.035)	(0.025)
Observations	5,778	5,471
R-squared	0.063	0.007

[14] The dependent variable is average hourly kW usage during peak hours divided by average hourly kW usage during off-peak hours for non-holiday weekdays in the summer period (June through September 2010) and the non-summer period (October 2010 through April 2011). See Appendix B for additional details.

H2e: The CPP rate delivers the best combination of energy efficiency, demand response, and load-shifting benefits.

This hypothesis is designed to embody the previous three hypotheses (H2b, H2c, and H2d). Under the best of circumstances, it would have been difficult to combine these three hypotheses into a single rank ordering suitable for testing this joint hypothesis. Initially, the intention was to construct a rank order of the rate treatments based on the differential performance as suggested by the results from the three separate hypothesis tests above. The "best" combination would then be associated with the rate with the smallest average rank. However, the results from above indicate little or no significant differences among the rate treatments in their energy efficiency, demand response, or load-shifting benefits at the aggregate level. The data therefore provide no evidence in support of hypothesis H2e.

H2f: Customers on the IBR rate will experience greater satisfaction than customers on the other rates.

A test of this hypothesis requires a measure of customer satisfaction, which was collected through the administration of a survey to all CAP participants and control groups. This hypothesis was tested using an ANOVA-style comparison in which the dependent variable is each customer's average response to two questions in the final survey: question 22 asks customers to rate their satisfaction with their pricing plan on a scale from 0 to 10, where 0 represents "extremely dissatisfied" and 10 represents "extremely satisfied"; and question 23 asks customers to rate their satisfaction with ComEd on the same scale.[15] The independent variables again account for the several rate and technology treatments. The control group consists of customers on the IBR rate with eWeb technology, without notification of bill protection, and residing in SFNS housing. The hypothesis is that the coefficients for all the rate type variables are negative.

Table A-5 contains the results of this regression. Because the standard errors are high relative to the estimated coefficients, we find no evidence that customer satisfaction is significantly impacted by rate or technology treatments.

[15] Question 22 reads "Thinking about your experiences with ComEd's electricity pricing plan, how satisfied are you with this pricing plan?" Question 23 reads "Thinking about your experiences with ComEd as your electric utility, how satisfied are you with ComEd?"

Table A-5
Impacts of Rate Type of Customer Satisfaction[16]

Variable	Coef.	(S.E.)
Constant	5.839**	(0.272)
FLR	-0.294	(0.211)
CPP	-0.248	(0.194)
DA-RTP	-0.011	(0.202)
PTR	-0.093	(0.208)
TOU	-0.117	(0.218)
BIHD	0.007	(0.136)
AIHD	-0.094	(0.148)
PCT	0.190	(0.219)
Bill Protection	0.208	(0.268)
Purchase Tech.	-0.107	(0.254)
Educ./Notif.	0.312	(0.223)
SFSH	-0.236	(0.284)
MFNS	0.016	(0.111)
MFSH	-0.305	(0.244)
Observations	2,371	
R-squared	0.009	

Enabling Technology

All of the hypotheses related to enabling technology are based upon comparisons of data across all treatment cells. As was the case in testing for the effects of the rate treatments, these analyses include variables to account for all of the treatments that customers receive. Therefore, the models tend to be similar (and sometimes identical) to the models used to analyze the effects of the rate treatments. In other words, the analyses of these hypotheses are based upon the main model defined above.

To test the hypotheses related to enabling technology, it is necessary to develop definitions and measures of *implementation* and *adoption*. For purposes of these analyses, customers are considered to have *implemented* a technology when they install the device so that it is operational. They are deemed to have *adopted* a technology when they make continued use of the technology. The persistence of adoption is challenging to define because it involves the timing of customers'

[16] The dependent variable is average satisfaction score (0-10) self-reported for questions 22 and 23 in the final survey. See Appendix B for additional details.

apparent use of technologies, including lapses in use after initial transactions. Therefore, the measure of adoption is based on customers' self-reported use of technologies from the CAP final survey.

H3a: The basic in-home display (BIHD) will have a higher implementation rate than other enabling technologies.

This hypothesis test for rates of implementation (i.e., installation) across rate treatments requires the use of a logit regression model in which the dependent variable equals unity if the customer implemented the technology and zero if he/she did not. Again the independent variables account for rate and technology treatments. Because BIHD customers are the omitted technology group, the hypothesis is that the coefficients on the AIHD and PCT variables are negative, indicating a reduced likelihood of implementation for those technologies.

Table A-6 shows the results that compare the implementation rates of the BIHD, AIHD, and PCT technologies. The results confirm the hypothesis, as both the AIHD and PCT coefficients are negative and statistically significant. The negative and statistically significant coefficient on the purchase technology variable is due to the fact that very few customers purchased technology, but the variable is set to unity for all of the customers who were offered the opportunity to purchase the technology. The constant coefficient indicates that customers on the flat rate, with BIHD, and in a single-family home with non-space heating have a 29.9% probability of implementing the in-home device.[17] By comparison, AIHD and PCT customers have 12.3% and 14.5% probabilities of implementing the in-home devices, respectively.

[17] 29.86% = exp(-0.854)/(1 + exp(-0.854))

Table A-6
Impacts of Technology on Implementation Rates[18]

Variable	Coef.	S.E	z	Prob
Constant	-0.854	0.117	-7.287	29.86%
CPP	0.293	0.134	2.192	36.33%
DA-RTP	0.175	0.142	1.233	33.65%
PTR	0.020	0.141	0.144	30.28%
TOU	0.281	0.141	1.993	36.05%
IBR	0.065	0.158	0.414	31.24%
AIHD	-1.106	0.087	-12.784	12.35%
PCT	-0.920	0.121	-7.622	14.50%
Purchase Tech.	-2.876	0.369	-7.799	2.34%
SFSH	-0.378	0.684	-0.553	22.58%
MFNS	-0.525	0.077	-6.811	20.12%
MFSH	-0.381	0.274	-1.39	22.53%
Observations	5,532			
R-squared	0.076			

H3b: The BIHD will have a higher adoption rate than other enabling technologies.

This test was conducted in the same way as the test of hypothesis H3a, substituting adoption (utilization) for implementation (installation) as the dependent variable. Adoption was determined based on each customer's response to question 6b in the final survey which asked customers how often they looked at their in-home device in recent months.[19] All customers who answered the question and did not choose "never" as their response were deemed to have adopted the technology.[20]

Table A-7 shows that none of the treatments have a significant impact on the likelihood of adopting an in-home device. The constant coefficient indicates that customers on the flat rate, with BIHD, and in a single-family home with non-

[18] The dependent variable is a binary choice variable that equals one if the customer implemented the technology and zero otherwise. See Appendix B for additional details.

[19] Question 6b reads: "How often did you look at the information [on] the IHD display in recent months?" with possible answers of "Never", "About once a month", "About once a week", "More than once a week but not daily", or "At least once each day".

[20] Additionally, customers had to have been in a treatment cell involving an in-home device and had to have *implemented* their device in order to adopt it. Of the 824 customers who answered question 6b, 106 customers answered the question even though they were not offered an IHD by ComEd (they may have had their own); and an additional 269 answered the question despite never having installed their offered device. Due to these restrictions, this analysis should be considered a test of the incremental likelihood of adopting an IHD given that the customer installed it.

space heating have a 68.0% probability of adopting the in-home device given that they installed it.[21]

Table A-7
Impacts of Technology on Adoption Rates[22]

Variable	Coef.	S.E	z	Prob
Constant	0.752	0.341	2.207	67.96%
CPP	0.031	0.404	0.076	68.63%
DA-RTP	0.043	0.426	0.101	68.89%
PTR	0.232	0.433	0.536	72.79%
TOU	-0.477	0.410	-1.164	56.83%
IBR	0.035	0.468	0.075	68.72%
AIHD	0.277	0.267	1.038	73.67%
PCT	0.354	0.401	0.884	75.14%
Purchase Tech.	0.348	0.898	0.387	75.03%
SFSH	-1.060	1.380	-0.768	42.36%
MFNS	0.118	0.249	0.475	70.47%
MFSH	-0.119	0.776	-0.154	65.32%
Observations	449			
R-squared	0.0139			

H3c: A combination of direct and indirect feedback solutions will achieve greater energy efficiency, demand response, and load-shifting benefits than indirect feedback solutions alone.

There are three separate hypotheses implied in H3c, and each is tested separately. A variation of the main model that includes independent variables in addition to those for rate and technology treatments is used to test this hypothesis. Specifically, the additional variables describe whether each customer has engaged in direct and/or indirect feedback solutions. Customers are designated as having engaged in direct feedback solutions when they have implemented and adopted BIHD- or AIHD-enabling technologies. Customers are designated as having engaged in indirect feedback solutions if they interacted with the OPOWER website three or more times over the course of the pilot.

Three indicator variables are added to the main model: one for the use of direct feedback solutions only; one for the use of indirect feedback solutions only; and

[21] 68.0% = exp(0.752)/(1 + exp(0.752))

[22] The dependent variable is a binary choice variable that equals one if the customer adopted the technology and zero otherwise. See Appendix B for additional details.

one for the use of both feedback solutions.[23] For any one of the measures (e.g., energy efficiency that is measured by differences in average usage), the hypothesis is that the coefficient on the indicator variable for the use of both feedback solutions is smaller than the coefficients on the direct- and indirect-only indicator variables.

Table A-8 presents the results of four summer and three non-summer models. None of the estimated effects for feedback solutions are significantly different from zero. Subsequent tests suggest that in all instances the estimated coefficient for the variable identifying both feedback solutions (Direct+Indirect) is not significantly different from that for the direct- or indirect-only feedback solutions. As a result, we reject hypothesis H3c.

Table A-8
Impacts of Feedback Solutions on Electricity Usage[24]

	All Summer Hours	**Summer Peak Hours**	**Event Hours**	**Summer P/O Ratio**	**All Non-summer Hours**	**Non-summer Peak Hours**	**Non-summer P/O Ratio**
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.225**	**1.315**	**1.870**	**1.053**	**0.796**	**0.667**	**0.829**
	(0.131)	(0.168)	(0.264)	(0.069)	(0.105)	(0.096)	(0.045)
CPP	0.076	0.094	-0.071	0.019	0.072	**0.129**	**0.058**
	(0.083)	(0.109)	(0.168)	(0.035)	(0.068)	(0.058)	(0.025)
DA-RTP	0.026	0.044	-0.061	0.034	-0.009	0.040	**0.055**
	(0.089)	(0.114)	(0.172)	(0.038)	(0.072)	(0.062)	(0.026)
PTR	0.015	0.043	-0.089	0.033	0.048	0.085	**0.05**
	(0.086)	(0.111)	(0.170)	(0.038)	(0.073)	(0.062)	(0.025)
TOU	0.057	0.060	-0.038	-0.025	0.089	0.125	0.032
	(0.097)	(0.127)	(0.192)	(0.038)	(0.082)	(0.073)	(0.026)
BIHD	0.010	0.002	-0.011	-0.040	-0.046	-0.045	-0.012
	(0.083)	(0.099)	(0.147)	(0.038)	(0.070)	(0.068)	(0.027)
AIHD	-0.007	-0.019	-0.035	-0.048	-0.055	-0.063	-0.020
	(0.091)	(0.110)	(0.164)	(0.040)	(0.072)	(0.069)	(0.028)
PCT	0.032	-0.015	-0.011	-0.070	-0.011	-0.049	-0.032
	(0.101)	(0.124)	(0.183)	(0.045)	(0.089)	(0.083)	(0.032)
	(0.300)	(0.378)	(0.543)	(0.103)	(0.337)	(0.318)	(0.058)

[23] The omitted (*i.e.*, base case) category is the use of neither feedback solution.

[24] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-8 (continued)
Impacts of Feedback Solutions on Electricity Usage

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Bill Protection	0.227	0.185	0.189	-0.079	0.329	0.339	0.015
	(0.167)	(0.187)	(0.262)	(0.053)	(0.184)	(0.183)	(0.035)
Purchase Tech.	-0.100	-0.151	-0.205	0.011	-0.072	-0.026	0.061
	(0.148)	(0.199)	(0.298)	(0.085)	(0.115)	(0.123)	(0.061)
Educ./Notif.	0.093	0.143	0.293	0.069	0.113	0.127	0.054
	(0.162)	(0.204)	(0.319)	(0.081)	(0.135)	(0.122)	(0.052)
SFSH	0.264	0.317	0.332	0.057	1.016	0.904	0.090
	(0.238)	(0.379)	(0.433)	(0.113)	(0.717)	(0.487)	(0.129)
MFNS	**-0.684**	**-0.824**	**-1.199**	**-0.103**	**-0.440**	**-0.391**	0.030
	(0.043)	(0.053)	(0.076)	(0.023)	(0.035)	(0.035)	(0.018)
MFSH	**-0.722**	**-0.809**	**-1.204**	0.016	0.268	0.245	0.089
	(0.111)	(0.141)	(0.187)	(0.107)	(0.198)	(0.184)	(0.128)
Direct Feedback	-0.044	-0.061	-0.088	-0.034	0.030	0.023	0.001
	(0.053)	(0.069)	(0.099)	(0.023)	(0.041)	(0.040)	(0.017)
Indirect Feedback	-0.172	-0.165	-0.359	0.042	0.223	0.259	0.039
	(0.269)	(0.338)	(0.466)	(0.089)	(0.322)	(0.304)	(0.046)
Direct+Indirect	0.316	0.270	0.515	-0.083	-0.130	-0.213	-0.079
	(0.300)	(0.378)	(0.543)	(0.103)	(0.337)	(0.318)	(0.058)
Observations	677	677	677	677	680	680	680
R-squared	0.225	0.199	0.200	0.044	0.178	0.162	0.027

H3d: The advanced in-home display/ programmable controllable thermostat (AIHD/PCT) solution will achieve greater energy efficiency, demand response, and load-shifting benefits than other enabling technology.

There are three separate hypotheses implied in H3d, and each is tested separately. They are tested using models similar to the main model with the addition of several variables. The hypothesis in each case is that the coefficient for the AIHD/PCT technology treatment is smaller than the coefficients on the other technology type variables. Because of the small number of PCT installations, the regressions use eWeb as the control group technology; but greater benefits from AIHD/PCT, if they exist, may be inferred from the results.

In Table A-9 the estimated coefficients show how usage (in average kWh per hour) is related to the rate and technology treatments. The table's columns each present results for a different period. These models differ from the main model in that they include both the technology-type indicator variables, as well as variables that are interactions between technology type and whether the customer implemented (i.e., installed) the technology. These inclusions facilitate differentiation between the intention to treat and the actual treatment. However, the treatment in this case is not randomly assigned. For example, customers who implemented BIHD have higher average usage levels (over all summer and non-summer hours) than customers with no technology. It is not possible to distinguish whether this effect is caused by the technology (which seems unlikely) or the fact that customers who chose to implement the technology tended to have higher usage levels (which seems more plausible). Because none of the technology-specific implementation coefficients in Table A-9 are negative and significantly different from zero at the 5% level, there is little or no evidence to suggest that enabling technologies lead to lower levels of usage as measured in any of these three different ways.

Table A-9 also contains the results of a test of the effects of rate and technology treatments on the ratios of peak to off-peak usage. Customers who implemented BIHD and AIHD have lower ratios of peak to off-peak usage than customers who do not have enabling technology, and based on the size of the corresponding standard errors, these differences are statistically significant.[25] As before, it is difficult to know whether these findings are due to effects of the technology or are indicative of the kinds of customers who choose to implement the technology. In addition, the result is somewhat strange because BIHD customers have higher peak-period usage than non-technology customers and AIHD customers' peak-period usage is not different from that of non-technology customers. Consequently, the results seem to indicate that the customers who install these technologies tend to have especially high levels of off-peak usage.

[25] Both of these coefficients are negative and significant in the model for summer months. Only the BIHD Implement coefficient is significantly different from zero in the model for non-summer months.

Table A-9
Impacts of Technology on Electricity Usage[26]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.376**	**1.562**	**2.230**	**1.119**	**0.933**	**0.844**	**0.904**
	(0.047)	(0.059)	(0.091)	(0.022)	(0.036)	(0.034)	(0.015)
CPP	0.041	0.056	0.000	0.004	0.034	0.051	0.016
	(0.033)	(0.041)	(0.058)	(0.014)	(0.027)	(0.026)	(0.011)
DA-RTP	0.061	**0.099**	0.100	0.038*	0.021	0.034	0.017
	(0.036)	(0.045)	(0.063)	(0.016)	(0.029)	(0.028)	(0.012)
PTR	0.061	0.082	0.081	0.007	0.036	0.051	0.022
	(0.037)	(0.046)	(0.064)	(0.015)	(0.029)	(0.028)	(0.012)
TOU	0.065	0.060	0.068	-0.015	0.022	0.015	-0.018
	(0.037)	(0.046)	(0.065)	(0.015)	(0.030)	(0.029)	(0.012)
BIHD	-0.038	-0.018	-0.018	**0.025**	-0.024	-0.016	0.012
	(0.026)	(0.033)	(0.046)	(0.012)	(0.020)	(0.020)	(0.009)
AIHD	0.023	0.048	0.079	**0.025**	-0.003	0.001	0.012
	(0.028)	(0.035)	(0.049)	(0.012)	(0.022)	(0.022)	(0.009)
PCT	0.000	-0.010	0.006	0.010	-0.034	-0.041	0.001
	(0.035)	(0.042)	(0.059)	(0.015)	(0.026)	(0.025)	(0.011)
Bill Protection	0.025	0.042	0.077	0.030	0.044	0.041	0.005
	(0.041)	(0.052)	(0.073)	(0.018)	(0.037)	(0.036)	(0.013)
Purchase Tech.	-0.033	-0.039	-0.060	-0.008	-0.026	-0.026	-0.010
	(0.044)	(0.056)	(0.076)	(0.019)	(0.033)	(0.033)	(0.013)
Educ./Notif.	-0.075	-0.106	**-0.222**	-0.010	-0.045	-0.030	0.022
	(0.057)	(0.071)	(0.106)	(0.026)	(0.045)	(0.043)	(0.018)
SFSH	0.064	0.086	-0.082	0.031	**1.401**	**1.381**	0.052
	(0.165)	(0.216)	(0.265)	(0.069)	(0.410)	(0.402)	(0.042)
MFNS	**-0.677**	**-0.867**	**-1.228**	**-0.155**	**-0.436**	**-0.41**	-0.001
	-0.016	(0.020)	(0.028)	(0.008)	(0.013)	(0.012)	(0.007)
MFSH	**-0.693**	**-0.845**	**-1.202**	-0.059	**0.496**	**0.437**	-0.015
	(0.038)	(0.047)	(0.068)	(0.035)	(0.071)	(0.073)	(0.025)

[26] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-9 (continued)
Impacts of Technology on Electricity Usage

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
BIHD Implement	**0.100**	0.075	0.111	**-0.043**	**0.083**	**0.065**	**-0.020**
	(0.033)	(0.042)	(0.059)	(0.013)	(0.026)	(0.025)	(0.010)
AIHD Implement	0.097	0.077	0.045	**-0.042**	**0.116**	**0.105**	-0.009
	(0.051)	(0.067)	(0.090)	(0.018)	(0.038)	(0.038)	(0.014)
PCT Implement	-0.054	-0.095	-0.076	0.002	-0.022	-0.040	-0.001
	(0.188)	(0.232)	(0.296)	(0.074)	(0.119)	(0.106)	(0.046)
Observations	5,778	5,778	5,778	5,778	5,471	5,471	5,471
R-squared	0.193	0.196	0.199	0.065	0.176	0.164	0.007

H3e: The AIHD/PCT solution in combination with the CPP rate will achieve greater energy efficiency, demand response, and load-shifting benefits than other enabling technology and pricing plan combinations.

The hypothesis to be tested is that usage by customers in cell D4 is lower than usage by customers in other cells. Table A-10 contains results of statistical comparisons of usage as measured by the four main measures of usage discussed throughout this appendix. These comparisons are all relative to the control group in cell F3 (which contains customers on the flat rate who have an AMI meter, and have received basic AMI education) with SFNS housing, which is represented in the regression by the constant term. The coefficient on the constant term indicates that the average hourly consumption of SFNS customers in cell F3 in all summer hours equals 1.377 kWh. Average hourly consumption for customers in each other cell equals the constant coefficient plus the coefficient on the appropriate indicator or dummy variable. For example, the estimated average hourly consumption of customers in cell D1a in all summer hours is lower and equals 1.353 kWh (= 1.377 - 0.024).

In general, there are few instances where treatments had a significant effect. There are some instances where event-hour usage by CPP customers is significantly different than that of customers in the control group. Specifically, during peak periods on event days, customers in treatment cell F3 (the control group) consume more electricity than customers in two of the five CPP cells (D2 and D4 have negative coefficients with are significant). However, customers in treatment cell F5 (flat rate customers with e-Web and education) also consume less electricity on average during peak periods on event days than the control group, and they only differ from the control group customers in that they received additional education.

Table A-10 also reports the results explaining how the ratios of peak to off-peak usage differ by treatment cell in the summer (5th column) and the non-summer periods (7th column). Based on the high standard errors (and resulting lack of statistical significance), Table A-10 shows that summer peak-to-offpeak usage ratios for most customers (except those in treatment cell L1b) are statistically indistinguishable from the average for customers in group F3. In the non-summer models, shown in the three rightmost columns of table A-10, the only significant treatment effects are found in the peak-to-off-peak ratio model. Several CPP and DA-RTP treatment cells and all of the PTR treatment cells use significantly more electricity during peak hours relative to offpeak hours when compared to the control cell, F3.

The exceptions provide highly selective support for hypothesis H3e; but in general, the evidence that usage by customers in cell D4 is lower than usage by customers in other cells is rather weak.

Table A-10
Usage of Cells Relative to Cell F3[27]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.377**	**1.564**	**2.232**	**1.119**	**0.934**	**0.844**	**0.904**
	(0.047)	(0.059)	(0.091)	(0.022)	(0.036)	(0.035)	(0.015)
D1a	-0.024	-0.045	-0.196	-0.014	-0.007	0.015	0.026
	(0.056)	(0.070)	(0.105)	(0.026)	(0.043)	(0.042)	(0.018)
D1b	0.035	0.043	-0.092	0.018	0.063	0.100	0.042
	(0.068)	(0.086)	(0.128)	(0.031)	(0.058)	(0.059)	(0.022)
D2	-0.057	-0.060	**-0.246**	0.010	-0.043	0.000	**0.057**
	(0.056)	(0.071)	(0.105)	(0.027)	(0.043)	(0.042)	(0.019)
D3	0.007	0.013	-0.125	0.011	0.025	0.056	**0.046**
	(0.057)	(0.072)	(0.108)	(0.026)	(0.044)	(0.043)	(0.018)
D4	-0.032	-0.060	**-0.222**	0.001	-0.024	-0.000	**0.04**
	(0.058)	(0.070)	(0.105)	(0.026)	(0.044)	(0.042)	(0.018)
D5	-0.021	-0.042	-0.166	-0.009	-0.013	0.024	**0.06**
	(0.068)	(0.084)	(0.123)	(0.029)	(0.049)	(0.048)	(0.021)

[27] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-10 (continued)
Usage of Cells Relative to Cell F3

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
D6	-0.059	-0.056	-0.166	0.015	-0.004	0.025	**0.043**
	(0.057)	(0.072)	(0.108)	(0.026)	(0.043)	(0.041)	(0.018)
D7	0.074	0.103	0.029	0.022	-0.001	0.033	**0.061**
	(0.076)	(0.101)	(0.143)	(0.031)	(0.054)	(0.053)	(0.021)
D8	0.030	0.004	-0.100	-0.012	-0.030	-0.011	**0.041**
	(0.063)	(0.079)	(0.119)	(0.029)	(0.046)	(0.043)	(0.020)
F5	-0.075	-0.101	**-0.270**	0.010	-0.027	-0.006	0.033
	(0.072)	(0.088)	(0.125)	(0.031)	(0.060)	(0.058)	(0.022)
F6	-0.091	-0.118	-0.195	-0.013	-0.039	-0.028	0.022
	(0.062)	(0.077)	(0.117)	(0.028)	(0.051)	(0.048)	(0.021)
F7	-0.032	-0.035	-0.104	0.010	-0.055	-0.037	0.031
	(0.073)	(0.089)	(0.131)	(0.031)	(0.054)	(0.051)	(0.026)
L1a	-0.042	-0.037	-0.145	0.020	-0.019	0.012	0.041
	(0.066)	(0.082)	(0.120)	(0.033)	(0.052)	(0.050)	(0.021)
L1b	-0.031	-0.013	-0.093	**0.062**	-0.007	0.012	**0.045**
	(0.069)	(0.084)	(0.125)	(0.031)	(0.057)	(0.055)	(0.020)
L2	0.009	0.034	-0.080	0.041	-0.014	0.020	**0.047**
	(0.057)	(0.073)	(0.108)	(0.027)	(0.043)	(0.042)	(0.018)
L3	0.026	0.051	-0.017	0.045	0.004	0.020	0.041
	(0.066)	(0.085)	(0.127)	(0.031)	(0.051)	(0.049)	(0.022)
L4	0.002	-0.013	-0.112	-0.015	-0.045	-0.032	0.003
	(0.060)	(0.077)	(0.116)	(0.030)	(0.046)	(0.046)	(0.021)
L5a	0.024	-0.006	-0.082	-0.018	0.009	0.010	0.005
	(0.059)	(0.073)	(0.110)	(0.026)	(0.046)	(0.044)	(0.018)
L5b	-0.099	-0.122	-0.227	-0.008	-0.071	-0.060	0.007
	(0.066)	(0.082)	(0.123)	(0.030)	(0.052)	(0.050)	(0.021)
L6a	-0.070	-0.095	-0.225	-0.007	-0.046	-0.023	0.026
	(0.068)	(0.085)	(0.123)	(0.030)	(0.050)	(0.051)	(0.023)

Table A-10 (continued)
Usage of Cells Relative to Cell F3

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
L6b	0.002	-0.016	-0.135	-0.010	-0.049	-0.032	0.005
	(0.071)	(0.091)	(0.126)	(0.032)	(0.051)	(0.051)	(0.022)
SFSH	0.057	0.079	-0.086	0.031	**1.400**	**1.382**	0.054
	(0.166)	(0.217)	(0.268)	(0.069)	(0.408)	(0.400)	(0.042)
MFNS	**-0.682**	**-0.871**	**-1.233**	**-0.153**	**-0.44**	**-0.413**	-0.001
	(0.016)	(0.020)	(0.028)	(0.008)	(0.013)	(0.012)	(0.007)
MFSH	**-0.693**	**-0.845**	**-1.201**	-0.059	**0.495**	**0.437**	-0.014
	(0.038)	(0.047)	(0.068)	(0.036)	(0.071)	(0.073)	(0.025)
Observations	5,778	5,778	5,778	5,778	5,471	5,471	5,471
R-squared	0.193	0.196	0.200	0.063	0.174	0.162	0.008

H3f: Customers activating a BIHD will experience greater satisfaction than customers who have received and activated other enabling technology.

This hypothesis test is conducted using a model similar to that which was developed for hypothesis H2f. Satisfaction is measured as the average of customer responses to questions 22 and 23 of the CAP final survey. The control group consists of customers on the FLR rate with BIHD technology (i.e. in treatment cell F6) residing in SFNS housing. The hypothesis would be supported if the coefficients for AIHD and PCT were significant and negative; but because this is not the case, the hypothesis is rejected. The results show that, relative to the control group, only the option to purchase technology (a positive effect, counter-intuitively) and MFSH housing (a negative effect) significantly impact customer satisfaction.

Table A-11
Impacts of Technology on Customer Satisfaction[28]

Variable	Coef.	(S.E)
Constant	6.068	(0.352)
CPP	-0.178	(0.436)
DA-RTP	0.036	(0.425)
PTR	0.037	(0.442)
TOU	-0.098	(0.444)
IBR	0.003	(0.470)
AIHD	-0.098	(0.279)
PCT	-0.106	(0.419)
Purchase Tech.	1.663	(0.571)
SFSH	-0.194	(0.366)
MFNS	0.209	(0.277)
MFSH	-2.600	(0.727)
Observations	497	
R-squared	0.026	

Enabling Technology Acquisition

All of the hypotheses regarding the acquisition of enabling technologies are based upon comparisons of data within two cells: customer groups L5a and L5b, and customer groups L6a and L6b.

Hypotheses H4b, H4c, and H4d assert that customers who willingly purchase enabling technology, albeit at a subsidized cost, will take actions that differ from those who were offered the technology at no cost.[29]

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[28] The dependent variable is the average satisfaction score (0-10) self-reported for questions 22 and 23 in the final survey. See Appendix B for additional details.

[29] One sub-set of customers was offered the opportunity to purchase the BIHD for $42 and another was offered the AIHD for $84.

H4a: The acquisition rate of free enabling technology will exceed that of purchased enabling technology.[30]

Customers in groups L5a and L6a were given enabling technologies at no cost. Customers in groups L5b and L6b were offered enabling technologies for purchase. Table A-12 provides data on how many customers in each group were offered enabling technologies, how many acquired those technologies, how many implemented the technologies, and how many self-reported adopting the technology. It also provides the acquisition rates (number acquired divided by number offered, expressed as a percentage), implementation rates (number implemented divided by number acquired, expressed as a percentage), and adoption rates (number adopted divided by number of customers who reported any adoption behavior, expressed as a percentage).[31]

The acquisition rate for free BIHDs is 100%, because the CAP project provided customers with this technology without the customer having to request it. The acquisition rate for free AIHDs is unknown because the available data do not identify how many free AIHDs were sent. By contrast, of the 450 customers in groups L5b and L6b who were offered technology for purchase at a heavily subsidized price, only 9 (or 2%) accepted the purchase offer.

While the numbers of customers purchasing the technologies were too small to support formal ANOVA tests, these descriptive data support the assertion that only a small fraction of customers are likely to purchase enabling technology. However, because customers who obtained the technology free of charge did so without requesting the technology, there is no way to know what proportion of these customers would have actually requested the technology at no cost had they been required to opt in.

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[30] Because all customers who were given the BIHD and AIHD are coded as having acquired the technology, this hypothesis is true by definition unless all customers who were offered the opportunity to purchase the technology did purchase it.

[31] The implementation rate for L6a (free AIHDs) was calculated by dividing the number of implemented free AIHDs by the number of *potentially* acquired free AIHDs (0.12 - 27/225).

Table A-12
Acquisition, Implementation, and Adoption of Free and Purchased Technology

	Numbers					Rates		
	Offer	**Acquire**	**Imple-ment**	**Adopt**	**Did not Adopt**	**Acquire**	**Imple-ment**	**Adopt**
For Free								
L5a	525	525	171	30	28	100%	33%	52%
L6a	225	Unknown	27	15	3	Unknown	12%	83%
For Purchase								
L5b	225	5	4	2	2	2%	80%	50%
L6b	225	4	4	2	0	2%	100%	100%

H4b: The implementation rate of purchased enabling technology will exceed that of free enabling technology.

Table A-12 also contains data that suggest that customers who purchased enabling technologies implemented the technologies at much higher rates than did customers who were given the technologies at no cost (80% and 100% versus 12% and 33%, though these values are based on small samples). On the one hand, this is a plausible result; people who pay for something are more likely to place a higher value on it than people who receive it at no cost. On the other hand, the rates of implementation in Table A-12 for those receiving the technology at no cost may well understate the rates of implementation that would be experienced if customers had been required to at least *request* the technology. In summary, the available evidence supports the hypothesis; but the evidence would be stronger if: a) customers given the enabling technology were required to request the technology; and b) there was a large population of customers who were offered the technology for purchase so that the "for purchase" acquisition and implementation rates were more statistically meaningful.

H4c: The adoption rate of purchased enabling technology will exceed that of free enabling technology.

Table A-12 also contains data suggesting that adoption rates for enabling technology are similar regardless of whether the IHD was offered for free or made available for purchase. The data suggest that when a BIHD is offered for free or for purchase, the adoption rate is 53% and 50%, respectively. The adoption rate for free AIHDs is 83% and the adoption rate of for purchase AIHDs is 100%. Because the sample is so small (resulting in essentially anecdotal evidence), however, the hypothesis can neither be accepted nor rejected.

H4d: Purchased enabling technology will achieve greater energy efficiency, demand response, and load-shifting benefits than free enabling technology.

To test this hypothesis, we restrict our analyses to include only customers in treatment cells L5 and L6, which were split so that some customers were given the technology while others were offered it for purchase. The control group for these regressions includes customers on the TOU rate who received BIHD at no cost (i.e. treatment cell L5a), and who reside in SFNS housing.

Table A-13 contains the results of four summer and three non-summer regressions. There are no significant relationships between the measures of usage and whether the customer was offered the technology for free or for purchase. Only housing type has a significant effect.

Table A-13
Usage Comparisons by Method of Obtaining Technology[32]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.35**	**1.498**	**2.084**	**1.093**	**0.923**	**0.836**	**0.913**
	(0.041)	(0.051)	(0.073)	(0.014)	(0.031)	(0.029)	(0.009)
AIHD	-0.015	-0.010	-0.047	0.006	-0.026	-0.009	0.012
	(0.047)	(0.059)	(0.080)	(0.019)	(0.035)	(0.035)	(0.015)
Purchase Tech.	-0.040	-0.032	-0.044	0.006	-0.047	-0.044	-0.008
	(0.046)	(0.058)	(0.080)	(0.019)	(0.035)	(0.035)	(0.014)
SFSH	-0.197	-0.085	-0.304	0.186	**1.825**	**1.747**	0.039
	(0.278)	(0.425)	(0.717)	(0.153)	(0.276)	(0.367)	(0.054)
MFNS	**-0.602**	**-0.766**	**-1.121**	**-0.123**	**-0.414**	**-0.384**	-0.002
	(0.042)	(0.051)	(0.070)	(0.020)	(0.032)	(0.031)	(0.016)
MFSH	**-0.651**	**-0.828**	**-1.23**	-0.135	**0.67**	**0.536**	-0.059
	(0.089)	(0.094)	(0.129)	(0.070)	(0.157)	(0.147)	(0.052)
Observations	994	994	994	994	946	946	946
R-squared	0.141	0.144	0.158	0.043	0.159	0.143	0.002

Bill Protection

There are three hypotheses in the analysis plan that relate to bill protection. These hypothesis tests are based upon comparisons of data within two cells:

- Customer groups D1a and D1b (customers on the CPP rate with e-Web technology, where customers in sub-group "a" were not informed of bill protection, while those in sub-group "b" were); and

[32] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

- Customer groups L1a and L1b (customers on the DA-RTP rate with e-Web technology, where customers in sub-group "a" were not informed of bill protection, while those in sub-group "b" were).

H5a: The adoption rate of a dynamic pricing plan will be greater when bill protection is offered than when it is not offered.

This hypothesis was tested using a logit model. The dependent variable takes on a value of unity if the customer opted out of the pilot, and a value of zero otherwise. The independent variables include indicators for each of the rate treatments and housing types, and an indicator variable distinguishing customers who have been notified of bill protection. Only customers in cells D1 (CPP) and L1 (DA-RTP) are included in the sample. The hypothesis being tested is that the coefficient on the bill protection variable is negative.

Table A-14 shows the estimated impact of bill protection on opt-out rates. The coefficient for the constant implies an opt-out rate of 4.1% for CPP customers with eWeb technology and SFNS housing who were not informed of bill protection.[33] The opt-out rate for DA-RTP customers is calculated from the sum of the constant term and the coefficient on the DA-RTP indicator variable. The impact of bill protection is implied by the coefficient on the dummy variable for bill protection. The very small z-statistic indicates that bill protection did not significantly affect opt-out rates, though it should be noted that opt-out rates are quite low overall.[34]

Table A-14
Impact of Bill Protection on Opt-Out Rates[35]

Variable	Coef.	(S.E)	z	Prob
Constant	-3.157	(0.256)	-12.336	4.1%
DA-RTP	-0.889	(0.461)	-1.929	1.7%
Bill Protection	0.188	(0.373)	0.505	4.9%
MFNS	-0.626	(0.412)	-1.519	2.2%
SFSH	(omitted)			
MFSH	(omitted)			
Observations	1,119			
R-squared	0.0248			

[33] 4.1% = exp(-3.157)/(1 + exp(-3.157))

[34] See Table A-22 for a summary of opt-outs by rate treatment and month.

[35] The dependent variable is a binary choice variable that equals one if the customer opted out of the pilot program and zero otherwise. See Appendix B for additional details.

H5b: Customers without bill protection will achieve greater energy efficiency, demand response, and load-shifting benefits than customers with bill protection.

To test this hypothesis, four summer and three non-summer tests are specified where the dependent variable for each test is one of the four main measures of customer usage. Furthermore, to test these hypotheses, we restrict our analyses to include only customers in cells D1 and L1, which were split so that some customers were notified of bill protection and others were not. The regression models include two independent variables of particular interest: Bill Protection, which is the variable of interest, takes on a value of unity if the customer was notified of bill protection and a value of zero otherwise: and CPP takes on a value of unity if the customer is in the CPP treatment and a value of zero otherwise. Thus, the treatment group for the DA-RTP rate with eWeb technology and without bill protection serves as the control group for this regression analysis.

Table A-15 contains the results for these seven separate hypothesis tests. Since the standard errors associated with the estimated coefficients on bill protection are large in all seven models, there is no evidence of any significant difference in these three measures of electricity consumption between customers who were notified of bill protection and those who were not notified.

Table A-15
Usage Comparisons by Notification of Bill Protection[36]

	All Summer Hours	**Summer Peak Hours**	**Event Hours**	**Summer P/O Ratio**	**All Non-summer Hours**	**Non-summer Peak Hours**	**Non-summer P/O Ratio**
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.325**	**1.516**	**2.067**	**1.142**	**0.920**	**0.860**	**0.952**
	(0.047)	(0.059)	(0.082)	(0.020)	(0.036)	(0.035)	(0.013)
CPP	0.036	0.016	-0.031	-0.038	0.032	0.033	-0.011
	(0.044)	(0.055)	(0.077)	(0.020)	(0.037)	(0.037)	(0.014)
Bill Protection	0.040	0.062	0.085	0.037	0.044	0.047	0.010
	(0.044)	(0.056)	(0.079)	(0.020)	(0.039)	(0.039)	(0.014)
SFSH	**0.528**	0.649	0.440	0.031	**1.571**	**1.639**	0.042
	(0.241)	(0.508)	(0.573)	(0.182)	(0.732)	(0.795)	(0.105)
MFNS	**-0.699**	**-0.899**	**-1.234**	**-0.159**	**-0.504**	**-0.498**	**-0.031**
	(0.038)	(0.047)	(0.066)	(0.018)	(0.031)	(0.029)	(0.015)
MFSH	**-0.656**	**-0.789**	**-1.094**	0.001	**0.568**	**0.550**	0.013
	(0.076)	(0.100)	(0.147)	(0.098)	(0.170)	(0.184)	(0.043)
Observations	975	975	975	975	917	917	917
R-squared	0.221	0.228	0.219	0.075	0.229	0.229	0.007

H5c: Customers with bill protection will experience greater satisfaction than customers without bill protection.

This hypothesis test is conducted using the model developed to test hypothesis H2f, where the dependent variable is a measure of satisfaction obtained by averaging customer responses to questions 22 and 23 of the CAP final survey. Here, again, only customers who are in treatment cells D1a, D1b, L1a, or L1b and who answered the final survey are included in the sample. An indicator variable for the notification of bill protection is included, and the hypothesis is that the coefficient on this variable is positive.[37]

Table A-16 presents the results of this hypothesis test. The high standard error for the Bill Protection coefficient indicates that customers who were notified of bill protection (at the beginning of the program) do not experience significantly different levels of satisfaction as compared to customers who were not notified.

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[36] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

[37] The omitted (*i.e.*, "base case") category is customers who were not notified of bill protection.

Table A-16
Impact of Bill Protection on Customer Satisfaction[38]

Variable	Coef.	(S.E)
Constant	**5.707**	(0.225)
DA-RTP	0.349	(0.268)
Bill Protection	0.277	(0.291)
SFSH	**-1.707**	(0.225)
MFNS	0.212	(0.280)
MFSH	0.112	(0.816)
Observations	305	
R-squared	0.013	

It is important to note that the results of these hypotheses regarding bill protection should be interpreted with some caution. It is our understanding that throughout the Pilot, ComEd had an unstated policy of making all customers whole at the end of the Pilot. Thus, there is some chance that ComEd's intention in this regard may have been revealed (accidentally or intentionally) during the course of the Pilot to customers other than those in cells D1b and L1b, who were explicitly notified that they will receive bill protection. There are some data indicating which customers were told of the bill protection when they attempted to opt out of the program; and question 2i of the final survey asks if customers were aware that they would be made whole.[39] However, because the survey question was vaguely worded, we are still unable to know exactly which customers may have been notified of bill protection informally (e.g., by a neighbor).

Customer Education

For this group of hypotheses, customers in treatment cell F3 received Basic AMI Education. Customers in this treatment cell received awareness education about the smart meter system and the flat rate they are charged for electricity (disseminated through materials that came with meter installation and a Rate Notification Letter). Customers in this group had access to Energy Tips on the OPOWER website, as well as access to the hourly data on the website.

Customers in all other treatment cells received the Education treatment. It involved Basic AMI Education *plus* detailed rate education, access to the Customer Education Package (by mail or online), a monthly OPOWER report, IHD videos (available online), an IHD user manual, and a quick-start guide for

[38] The dependent variable is average satisfaction score (0-10) self-reported for questions 22 and 23 in the final survey. See Appendix B for additional details.

[39] Question 2i asks customers to agree or disagree with the following statement, "My pricing plan includes a rate guarantee."

applicable cells. All customers who are not in treatment cells F1 or F3 received this education.

Customers in cell F1 are from ComEd's load research sample, and these customers are not involved in the pilot. Customers in this treatment cell received no education. Customers in cell F2 are also from the load research sample, but they received an AMI meter and full education. They pay the flat rate for electricity, and they reside outside of the AMI footprint.

H6a: Customers receiving customer education will achieve greater energy efficiency, demand response, and load-shifting benefits than customers who do not receive customer education.

The tests of this hypothesis are based on customers only from cells F1 and F2. Like many other hypotheses presented in this appendix, this is really a joint hypothesis, but each piece of it is tested separately. Thus, four summer and three non-summer regression models are specified, where the dependent variables correspond to the four main measures of electricity consumption. The independent variables are an indicator variable that is equal to unity if the customer received education (i.e., the customer is in cell F2) and zero if the customer did not (i.e., the customer is in cell F1) in addition to indicator variables for housing type. The hypothesis is that the coefficient on the F2 variable will be negative in each model.

This is a direct test of the effect of education on customer behavior, absent any additional influences from the dynamic rate treatments, the AMI meter, or any treatments for enabling technologies. It is impossible to include customers from any of the rate treatment groups in this test for the effect of education because all customers in treatments not paying the flat rate received customer education.

Table A-17presents the results of the seven regressions. The coefficients for the constant terms in each model represent the average of that model's dependent variable for customers in cell F1 with SFNS housing. The coefficients for the F2 dummy variables represent the differences in the various usage measures between customers in groups F1 and F2. The standard errors associated with the F2 variable in each model are too large for these differences to be statistically significant. Therefore, the evidence does not support hypothesis H6a.

Table A-17
Impact of Customer Education on Usage[40]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**2.235**	**2.751**	**3.629**	**1.311**	**1.441**	**1.371**	**0.954**
	(0.152)	(0.193)	(0.246)	(0.034)	(0.162)	(0.148)	(0.024)
F2	0.003	0.005	0.044	0.025	0.354	0.312	0.026
	(0.168)	(0.210)	(0.262)	(0.036)	(0.291)	(0.259)	(0.037)
SFSH	0.489	0.412	0.149	**-0.098**	**4.306**	**3.747**	**-0.085**
	(0.277)	(0.350)	(0.411)	(0.045)	(0.472)	(0.412)	(0.023)
MFNS	-0.389	**-0.663**	**-0.96**	**-0.165**	**-0.534**	**-0.504**	0.009
	(0.254)	(0.318)	(0.416)	(0.051)	(0.197)	(0.181)	(0.031)
MFSH	**-0.546**	**-0.947**	**-1.415**	**-0.196**	**1.842**	**1.662**	-0.013
	(0.197)	(0.248)	(0.313)	(0.043)	(0.307)	(0.282)	(0.044)
Observations	487	487	487	487	459	459	459
R-squared	0.045	0.053	0.055	0.046	0.286	0.277	0.012

H6b: Customers who receive customer education along with an AMI-enabled, non-flat rate and enabling technology will achieve greater energy efficiency, demand response, and load-shifting benefits than customers who are offered a flat rate and Basic AMI Education.

As was the case for the previous hypothesis, this is really a joint hypothesis, but each piece of it is tested separately. Thus, four summer and three non-summer regression models are specified where the dependent variable is one of the four main measures of electricity consumption. To test this hypothesis, one must compare customers who pay a flat rate and have only eWeb access, cell F3, with customers who do not pay a flat or IBR rate for electricity and who have an AMI-enabled, enabling technology (cells D2, D3, D4, D6, D7, D8, L2, L3, L5a, and L6a). The independent variables in each of these regression equations include indicators for housing type and an indicator variable that equals unity if the customer is in cell F3 (i.e., pays a flat rate and has only basic AMI education), and zero otherwise. Only customers in the treatment cells listed above are included in the sample. The hypothesis is that the coefficient on the F3 variable is positive in each model.

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[40] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-18 presents the results for the seven models used to test this hypothesis. The constant coefficients represent average hourly kWh usage for all customers in treatment groups where customers do not pay a flat or IBR rate, but do have an AMI-enabled enabling technology and SFNS housing. The coefficients for the dummy variable associated with the F3 variable reflect the differences in the respective measures of electricity usage between F3 and all other treatment groups mentioned above. The positive signs on these coefficients are as expected, but the large standard errors suggest that the effects are not statistically significant for any of the three periods. The only exception is for the non-summer model comparing peak-to-offpeak usage ratios. The negative and significant F3 coefficient estimate reported in the table suggests that in the non-summer months, customers in treatment cell F3 have flatter load shapes than those in the other treatment cells.

In summary, none of the evidence from the seven regressions supports hypothesis H6b.

Table A-18
Impact of Technology and Customer Education Usage[41]

	All Summer Hours	**Summer Peak Hours**	**Event Hours**	**Summer P/O Ratio**	**All Non-summer Hours**	**Non-summer Peak Hours**	**Non-summer P/O Ratio**
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.364**	**1.547**	**2.095**	**1.129**	**0.914**	**0.849**	**0.94**
	(0.016)	(0.020)	(0.029)	(0.006)	(0.011)	(0.011)	(0.004)
F3	0.014	0.019	0.141	-0.008	0.016	-0.008	**-0.037**
	(0.048)	(0.060)	(0.092)	(0.023)	(0.036)	(0.035)	(0.015)
SFSH	-0.014	-0.031	-0.192	0.006	**1.330**	**1.280**	0.058
	(0.191)	(0.240)	(0.312)	(0.073)	(0.488)	(0.456)	(0.045)
MFNS	**-0.686**	**-0.879**	**-1.247**	**-0.159**	**-0.427**	**-0.397**	0.001
	(0.020)	(0.025)	(0.035)	(0.010)	(0.016)	(0.015)	(0.008)
MFSH	**-0.695**	**-0.857**	**-1.198**	-0.068	**0.487**	**0.438**	-0.004
	(0.053)	(0.061)	(0.086)	(0.041)	(0.091)	(0.090)	(0.036)
Observations	3,817	3,817	3,817	3,817	3,645	3,645	3,645
R-squared	0.184	0.187	0.192	0.061	0.159	0.146	0.002

[41] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

H6c: Customers who receive customer education along with an AMI-enabled, non-flat rate and enabling technology will achieve greater energy efficiency, demand response, and load-shifting benefits than customers who receive customer education, a flat rate, and enabling technology.

As in the previous hypothesis, this is really a joint hypothesis, but each piece of it is tested separately. Thus, four summer and three non-summer regression models are specified where the dependent variable is one of the four main measures of electricity consumption. To test this hypothesis, one must compare customers who face the flat rate and have an AMI-enabled enabling technology (treatment cells F6 and F7) with customers who have an AMI-enabled enabling technology but who do not pay a flat or IBR rate (treatment cells D2, D3, D4, D6, D7, D8, L2, L3, L5a, and L6a). The independent variables in each of these regression equations include indicators for housing type and an indicator variable that equals unity if the customer is in cell F6 or F7 (i.e., pays a flat rate, has received education, and has enabling technology). The hypothesis is that the coefficient on the F6|F7 variable in each model is positive.

Table A-19 presents the results for the seven models related to measures of energy efficiency, demand response, and load shifting. The constant coefficient in each model represent average values of the dependent variable for the control group where customers do not face the flat rate, but are AMI-enabled, have enabling technology, and have SFNS housing. The coefficients on the F6| F7 dummy variables reflect the differences in usage between customers in the combined F6| F7 group and customers in the control groups. Although all seven estimated coefficients on the F6| F7 variable are negative, they also all have large standard errors, thus implying that the differences in usage between the two groups are not statistically significant.

In summary, none of the evidence from any of the seven tests supports hypothesis H6c.

Table A-19
Impact of Technology and Customer Education on Usage[42]

	All Summer Hours	**Summer Peak Hours**	**Event Hours**	**Summer P/O Ratio**	**All Non-summer Hours**	**Non-summer Peak Hours**	**Non-summer P/O Ratio**
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.366**	**1.547**	**2.097**	**1.127**	**0.915**	**0.849**	**0.939**
	(0.016)	(0.020)	(0.028)	(0.006)	(0.011)	(0.011)	(0.004)
F6 or F7	-0.051	-0.062	-0.014	-0.011	-0.030	-0.041	-0.011
	(0.035)	(0.044)	(0.063)	(0.015)	(0.028)	(0.027)	(0.013)
SFSH	-0.016	-0.032	-0.194	0.007	**1.329**	**1.28**	0.059
	(0.191)	(0.240)	(0.312)	(0.073)	(0.488)	(0.456)	(0.045)
MFNS	**-0.691**	**-0.879**	**-1.251**	**-0.152**	**-0.428**	**-0.397**	0.004
	(0.020)	(0.024)	(0.034)	(0.010)	(0.015)	(0.015)	(0.008)
MFSH	**-0.707**	**-0.884**	**-1.239**	**-0.087**	**0.476**	**0.422**	-0.007
	(0.051)	(0.057)	(0.081)	(0.038)	(0.089)	(0.087)	(0.035)
Observations	4,068	4,068	4,068	4,068	3,866	3,866	3,866
R-squared	0.185	0.187	0.192	0.057	0.156	0.143	0.001

H6d: Customers who receive customer education will experience greater satisfaction than customers without customer education.

As is the case with the other hypotheses that are related to customer satisfaction, this test uses a measure of satisfaction constructed by averaging the scores of questions 22 and 23 from the CAP final survey as the dependent variable. The model includes an indicator variable that equals unity for customers who receive education and a value of zero otherwise. Only customers in treatment cells F1 and F2 are used in the sample for this regression, and the control group consists of customers in treatment cell F1 (who received no education) with SFNS housing. The hypothesis is that the coefficient on the full education variable is positive.

Table A-20 presents results for the regression. The coefficient on the constant term indicates that the average satisfaction score for customers in the F1 treatment cell with SFNS housing is 5.098. The estimated coefficient on the full education variable indicates the incremental impact of education on customer satisfaction with respect to the control group. Although the estimated coefficient on the full education variable is positive as expected, the corresponding standard

[42] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

error is large so the effect is not statistically significant. Therefore, the evidence does not support hypothesis H6d.

Table A-20
Impact of Customer Education on Customer Satisfaction[43]

Variable	Coef.	(S.E)
Constant	**5.098**	(0.290)
Full Education	0.416	(0.307)
SFSH	0.236	(0.402)
MFNS	0.505	(0.436)
MFSH	0.546	(0.385)
Observations	260	
R-squared	0.016	

Customer Experience – Observable Steps

The tests of hypotheses related to customer experience involve codifying a number of observable steps that customers may take during participation in the CAP pilot. The following list contains examples of these observable steps:

1. Returned Survey A
2. Notification Preference Updated on survey with one or more of the following: email, text, and/or phone
3. Customer Education Package Requested on the survey
4. Requested Customer Education Package via RNL postcard
5. Created a Web Account
6. Called to schedule an OpenPeak, or to purchase a Tendril or OpenPeak
7. Activated a Tendril or OpenPeak
8. Called ComEd call center
9. Completed exit survey at the end of the study.

Throughout the pilot, data that allow us to construct metrics representing many of these steps were collected. In some cases, however, a particular step could not be directly measured or had to be interpreted to conform with the available data. Due to errors in the measurement and validation database (MVDB), Step 2 could not be observed. Step 4 is interpreted to mean that the customer sent in any postcard.[44] As a result, a customer may have completed any number between zero and eight steps.

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[43] Dependent variable: average satisfaction score (0-10) self-reported for questions 22 and 23 in the final survey. See Appendix B for additional details.

[44] The MVDB only indicates that a postcard was received and does not specify what information the postcard included.

H7a: Customers who engage in small, observable steps will achieve greater energy efficiency, demand response, and load-shifting benefits than customers who do not engage in those steps.

As in many of the previous hypotheses, this is really a joint hypothesis, but each piece of it is tested separately. Thus, four summer and three non-summer regression models are specified where the dependent variable is one of the four main measures of electricity consumption. These models build upon the main model by including two new variables: the first is an indicator variable that equals unity for customers who have engaged in any small, observable steps, and a value of zero otherwise; and the second is a count variable that equals an integer between zero and eight indicating the number of steps that a customer took. The hypothesis is that the coefficients on these variables for observable steps are negative.

Table A-21 presents the results of the seven regressions. Three of the models exhibit statistically significant impacts (i.e. statistically significant coefficients on the # of Steps and Any Steps variables) as a result of the steps: Summer Peak Hours, Event Hours, and Summer P/O Ratio. In all three models, the estimated coefficients for the indicator variable Any Steps (0 or 1) are positive and significant, suggesting (unexpectedly) that customers who engaged in any of the steps have higher average peak usage and usage ratios in the summer than customers who engaged in none of the steps. However, the negative and significant coefficients for the # of Steps (0 to 7) variables suggest that with each additional step taken, the customer exhibits decreasing peak usage and usage ratios in the summer.

One interpretation of these results is to conclude that only larger customers are inclined to take any steps, but thereafter, given the magnitude of the coefficients of interest, as long as the customer takes at least three steps, peak usage is likely to be lower than for customers who took no steps. The results partially confirm hypothesis H7a.

Table A-21
Impact of Small Observable Steps on Electricity Usage[45]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.366**	**1.543**	**2.192**	**1.116**	**0.945**	**0.854**	**0.905**
	(0.048)	(0.060)	(0.093)	(0.023)	(0.037)	(0.036)	(0.015)
CPP	0.045	0.062	0.006	0.004	0.037	**0.054**	0.016
	(0.033)	(0.041)	(0.058)	(0.014)	(0.027)	(0.026)	(0.011)
DA-RTP	0.064	**0.103**	0.104	**0.038**	0.024	0.036	0.017
	(0.036)	(0.045)	(0.063)	(0.016)	(0.030)	(0.028)	(0.012)
PTR	0.062	0.085	0.084	0.008	0.034	0.050	0.023
	(0.037)	(0.046)	(0.065)	(0.015)	(0.029)	(0.028)	(0.012)
TOU	0.071	0.068	0.077	-0.014	0.024	0.018	-0.018
	(0.037)	(0.046)	(0.065)	(0.015)	(0.030)	(0.029)	(0.012)
BIHD	-0.004	0.012	0.022	0.016	0.004	0.007	0.008
	(0.025)	(0.031)	(0.043)	(0.011)	(0.019)	(0.019)	(0.008)
AIHD	0.038	0.064	0.091	0.021	0.015	0.017	0.011
	(0.028)	(0.035)	(0.049)	(0.012)	(0.021)	(0.021)	(0.009)
PCT	0.016	0.004	0.015	0.005	-0.015	-0.024	0.001
	(0.035)	(0.041)	(0.058)	(0.015)	(0.026)	(0.025)	(0.011)
Bill Protection	0.024	0.040	0.076	0.030	0.043	0.041	0.005
	(0.041)	(0.052)	(0.073)	(0.018)	(0.037)	(0.036)	(0.013)
Purchase Tech.	-0.056	-0.060	-0.082	-0.002	-0.049	-0.045	-0.007
	(0.044)	(0.055)	(0.076)	(0.018)	(0.033)	(0.033)	(0.013)
Educ./Notif	-0.075	-0.104	**-0.218**	-0.008	-0.047	-0.031	0.023
	(0.057)	(0.071)	(0.106)	(0.026)	(0.045)	(0.043)	(0.018)
SFSH	0.055	0.072	-0.107	0.030	**1.404**	**1.384**	0.053
	(0.164)	(0.214)	(0.266)	(0.070)	(0.410)	(0.401)	(0.042)
MFNS	**-0.682**	**-0.871**	**-1.231**	**-0.154**	**-0.442**	**-0.415**	-0.001
	(0.016)	(0.020)	(0.028)	(0.008)	(0.013)	(0.012)	(0.007)
MFSH	**-0.693**	**-0.843**	**-1.198**	-0.057	**0.493**	**0.435**	-0.014
	(0.038)	(0.047)	(0.067)	(0.035)	(0.071)	(0.073)	(0.025)

[45] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-21 (continued)
Impact of Small Observable Steps on Electricity Usage

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
# of Steps (0 to 7)	-0.012	**-0.026**	**-0.034**	**-0.010**	0.004	0.000	-0.003
	(0.008)	(0.011)	(0.015)	(0.003)	(0.006)	(0.006)	(0.002)
Any Steps (0 or 1)	0.043	**0.087**	**0.138**	**0.024**	-0.030	-0.018	0.003
	(0.028)	(0.036)	(0.050)	(0.012)	(0.022)	(0.021)	(0.008)
Observations	5,778	5,778	5,778	5,778	5,471	5,471	5,471
R-squared	0.191	0.196	0.200	0.064	0.173	0.162	0.007

Customer Experience – Opt-Out Enrollment

CAP employed an opt-out design, the first major application of that approach to exposing residential customers to price and other treatments designed to induce changes in electricity usage. Four hypotheses were established to compare the performance for opt-out enrollment with opt-in recruitment practices, as follows;

H7b: An opt-out strategy will result in a higher enrollment percentage than an opt-in strategy.

This analysis requires comparing ComEd's CAP enrollment as a share of eligible customers to other utilities' reported shares of opt-in and opt-out customer enrollments.

H7c: An opt-out strategy will result in greater adoption of new pricing plans and enabling technology than an opt-in strategy.

This involves comparing reported rates of adoption of new pricing plans and enabling technology, differentiated by opt-in and opt-out strategies, using ComEd CAP and other's program data.

H7d: An opt-out strategy will result in greater energy efficiency, demand response, and load-shifting benefits than an opt-in strategy.

The analysis involves comparing the four main measures of energy usage (average usage across all hours; average usage during all peak-period hours; average usage during event hours; and the peak to off-peak usage ratio) distinguishing differences associated with the enrollment/recruitment process employed.

H7e: Customer satisfaction with an opt-out strategy will not be significantly different from satisfaction with an opt-in strategy.

The analysis involves comparing opt-out and opt-in programs based on customer satisfaction metrics.

A review of recent residential and small commercial pilots and experiments involving electricity pricing, feedback, and enabling technologies revealed only one in which an opt-out recruitment approach was employed. It was a relatively small initiative involving about 225 commercial customers. However, a modified opt-out recruitment method was employed in that the customers chosen were contacted and offered participation, but each had to affirm acceptance of the offer in order to be enrolled.

Opt-out enrollment, as widely used today, involves the automatic enrollment of people into programs, and participation is commenced for all those enrolled without explicit permission to do so. Each customer must subsequently take an action to be de-enrolled. The opt-out premise is that entities act in the (presumed) best interest of their employees or customers through automatic enrollment in certain types of programs rather than by soliciting participation that historically has resulted in low rates of participation.

In general, reports describing the opt-in pilots that we reviewed did not provide sufficient information to determine the opt-in acceptance rate, defined as the percentage of customers offered participation that undertook the actions required to become enrolled in the program. The following summary of opt-in programs was gleaned from a few reports[46] that provided data on realized residential

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[46] Electricity Pricing Structures for the 21st Century: Remodeling or New Construction? A Summary of Workshop Presentations and Dialogue, Nashville, TN. June 14-15, 2011. Sponsored by EPRI and the Tennessee Valley Authority, p. 25.

Baltimore Gas & Electric Smart Energy Pricing Pilot - Summer 2008. Ahmad Faruqui and Sanem Sergici, BGE's Smart Energy Pricing Pilot, Summer 2008 Impact, The Brattle Group, Inc., April 28, 2009.

Impact Evaluation of the California Statewide Pricing Pilot, (Residential Summary). Charles River Associates, Oakland, CA, March 16, 2005.

California's Statewide Pricing Pilot, (Commercial and Industrial Analysis Update). Freeman, Sullivan & Co. and Charles River Associates, Oakland, CA, June 28, 2006.

Results of CL&P's Plan-It Wise Energy Pilot. Connecticut Light and Power, Filing in Response to the Department of Public Utility Control's Compliance Order No. 4, Docket No. 05-10-03RE01, December 2009. Available at: http://nuwnotes1.nu.com/apps/clp/clpwebcontent.nsf/AR/PlanItWise/$File/Plan-it%20Wise%20Pilot%20Results.pdf

Evaluation of the (Commonwealth Edison) Residential Real Time Pricing (RRTP) Program, 2007-2010. Navigant Consulting, Inc., prepared for Commonwealth Edison Company, June 20, 2011.

The Effect on Electricity Consumption of the Commonwealth Edison Customer Application Program: Phase 2 Final Analysis. EPRI Report No. 1023644. EPRI, Christensen Associates Energy Consulting, LLC, R. Boisvert, Cornell University. October 21, 2011.

program opt-in rates. Note that additional information of interest on this topic, and related topics, will appear in a forthcoming EPRI report[47].

- Opt-in rates ranged from 1% to 18%. The most common reported rates were 4-7%.
- The highest rate (18%) was from a pilot of about 1,000 participants, but many were solicited for already established programs, which may account for the high acceptance rate.
- Another random design pilot of about 400 participants reported a 13% opt-in rate, recruited from a group of customers that already had smart meters installed.
- The largest pilots (6,000-12,000 participants) reported opt-in rates of 4-5% (e.g., twenty or more customers needed to be invited, or solicited through phone calls or mailings to obtain each participant in the pilot).
- The lowest rate (1%) is from an on-going program that has recruited participants for more than five years. It reflects response to periodic mailings of an offer to participate. Participants are also recruited using other methods, such as alternative rate design offers in conjunction with energy efficiency program offerings.
- A wide range of recruitment methods were employed. Most used mailings offered to prospective (or randomly selected) customers, followed by additional forms of engagement such as mailing more detailed information and phone calls.

Hydro One Networks Inc. Time-of-Use Pilot Project Results. EB-2007-0086, Susan Frank, submitted to the Ontario Energy Board, Ontario, Canada, May 13, 2008.

2008 Ex Post Load Impact Evaluation for Pacific Gas and Electric Company's SmartRateTM Tariff. Stephen George and Josh Bode, Freeman, Sullivan & Co., San Francisco, CA, December 30, 2008.

PowerCentsDCTM Power Program. eMeter Strategic Consulting for the Smart Meter Pilot Program, Inc., September 2010.

Public Service Electric and Gas Company. Dan Violette, Jeff Erickson, Mary Klos, Summit Blue Consulting, Final Report for the myPower Pricing Segments Evaluation, Public Service Electric and Gas Company, December 21, 2007.

Impact Evaluation of 2007 In-Home Display Pilot: Submitted to Progress Energy—Carolinas (Final Report). Summit Blue Consulting, LLC, Boulder, CO: October 2008.

Hydro One Pilot, Real Time Monitoring Pilot, Summer 2004-2005. Dean C. Mountain, Mountain Economic Consulting and Associates, Inc., March 2006.

Dominion Virginia Power, Power Cost Monitor Pilot – May 2008 to July 2009. Dean C. Mountain, Mountain Economic Consulting and Associates, Inc., January 2010.

Focus On Energy – PowerCost Monitor Study: Final Report. Energy Center of Wisconsin, April 16 2010.

Evaluation Report: OPOWER SMUD Pilot Year 2. Navigant Consulting, February 2011.

H. Allcott. “Social Norms and Energy Conservation,” Journal of Public Economics. Vol. 95, No. 9-10, p. 1082 (2011).

[47] *Understanding Electric Utility Customers: What we know and what we need to know.* EPRI, Palo Alto, CA: 2012. 1023562

- In most cases, participants were offered a participation inducement of $50-100.
- Most, but not all, of the programs were designed so that participant losses (i.e., bill increases) would be minimal (through a revenue neutral rate design) and/or offered feedback or enabling technology at no cost to the participant.

The spare and inconsistently reported nature of opt-in recruitments prevents formal testing of the four specified hypotheses (H7b-e). However, a few observations are warranted:

- ComEd opt-out enrollment achieved a very high overall level of participation (over 8,000), compared to most opt-in programs, and did so with a very low opt-out rate (about 2%). This result supports H7b's contention of a high opt-out enrollment percentage.
- However, a careful analysis of load changes revealed that 10% or less of participants responded to CPP and PTR elevated event prices or to RTP price changes; and enabling technology and feedback treatments did not affect usage, on average. CAP's 10% price responder rate seems to comport with the findings of opt-in pilots, assuming that those that volunteered are presumptively more inclined to respond.
- The low rate and potentially high cost of opt-in recruitment to achieve large participation rates argues for consideration of opt-out enrollment, even if the percentage of participants responding to the treatment is the same under either approach. It remains to be demonstrated convincingly that there are no unintended consequences (customer dissatisfactions) to subscribing customers automatically into an electric service plan they do not want, and would have rejected if offered.

Customer Experience – Comparisons

The following set of hypotheses relates to suggested changes in customer behavior that are based on information about rate comparisons and normative comparisons that customers receive in particular months or over a series of months.[48] The analysis of rate comparisons must: a) distinguish among losers according to the relative sizes of their losses (i.e., bill increases), and among winners according to the relative sizes of their gains (i.e., bill reductions); b) account for when losses or gains are made known to customers; and c) address cases in which a customer sees alternating monthly losses and gains. These requirements, along with difficulties in the data and in the consistent provision of normative comparisons throughout the CAP period, present significant obstacles to providing meaningful analyses to the hypotheses. Below, we provide a brief discussion of each hypothesis below but have not conducted any formal analyses.

[48] "Rate comparisons" show each customer both their actual monthly CAP bill and what their bill would have been under the flat rate. "Normative comparisons" show each customer their own usage level relative to a comparison group of their "neighbors."

Rather than discuss these hypotheses in the order that they are presented in previous CAP documents, we will group them here according to three subtopics: drop-out (opt-out) rates, rate comparisons, and normative comparisons.

Drop-out rates

Hypotheses H7f, H7i, H7j, and H7k address the rate at which customers choose to de-enroll from the program after experiencing certain conditions (such as a monthly loss or gain) in the CAP. Relatively few customers opted out of the program at all, and even fewer opted out during or after July 2010, when customers could be considered to have experienced one or more of the CAP treatments. Table A-22 presents the number of customers who opted out of CAP under each rate treatment by month.

Table A-22
Count of Dropouts by Rate and Month (March 2010 to February 2011)

Rate	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Rate Total
CPP	3	16	13	7	2	28	10	1				1	81
DAP	1	5	6			9							21
FLR	1	1											2
IBR		1				1	1						3
PTR	4	4	5	2	2	10	2						29
TOU	3	5	1	3	3	13	2	1				1	32
Month Total	12	32	25	12	7	61	15	2	0	0	0	2	168

As Table A-22 indicates, only 87 customers opted out of CAP during or after July 2010. August saw the highest number of customers leave the program, and CPP comprised the highest number of departures. July and August are the months during which CPP/PTR events were called and are also the months during which customers would have received their first bills under CAP. It is difficult to distinguish the effects of any one factor on a customer's choice to opt out of the program. However, ComEd did collect some information on the customers' self-reported motivations for opting out. Table A-23 contains a summary of the various reasons customers conveyed for opting out of the CAP and the number of customers that indicated each reason. The table shows that 21 of the 114 (18%) data points collected chose "causing higher bills" as the reason for opting out of CAP. Another 27 (24%) of the data points ("Won't save me money" and "Won't or can't shift usage") indicate other reasons related to billing amounts.

Table A-23
Opt-Out Reasons[49]

Opt-out Reason	**#**	**%**
Not interested	23	20%
Causing higher bills	21	18%
Won't or can't shift usage	16	14%
Too complex	12	11%
Won't save me money	11	10%
Violates my privacy	7	6%
Customer not at premise	6	5%
Don't have time	5	4%
Doesn't work	4	4%
Don't understand	4	4%
Medical issues in the home	4	4%
Dislike ComEd	1	1%
Total	114	100%

Each hypothesis is stated below along with a summary describing how the hypothesis could be tested in principle, however, in practice too few customers drop out to make the test meaningful.

H7f: Customers who are saving money will have a drop-out rate that is less than customers who are not saving money.

This hypothesis is indistinguishable from hypotheses H7i and H7j below. One difference in the analysis could involve the timing used to develop the variable

[49] CAP Pilot Dashboard (Data as of April 22, 2011)

indicating customer savings or losses. For instance, hypotheses H7i and H7j both depend upon customers receiving and viewing their rate comparisons, and therefore must account for some lag from the time the loss/gain is accumulated, the time the customer is made aware of it, and the time the customer adjusts their behavior in response to it. However, it may be possible for customers who use an in-home device or log onto the OPOWER website to know their savings or loss status immediately. As stated above, the low drop-out rate during the pilot period (i.e. after customers had received bills under CAP) prevented meaningful analysis of this hypothesis.

H7i: Customers whose rate comparison shows a monthly gain will have a drop-out rate that is lower than customers who experience a monthly loss.

For purposes of testing this hypothesis and distinguishing it from H7j, this could be interpreted as follows: "Customers who drop out are more likely to have experienced a monthly loss in the previous month than a monthly gain in the previous month." This hypothesis could be tested using a model similar to that which was developed to test hypothesis H2a (a logit model in which the dependent variable equals unity if the customer opted out of the pilot and zero if the customer did not). It would be necessary to add an independent indicator variable that equals unity if the customer experienced a loss in the previous billing month, and zero otherwise. The hypothesis is that the coefficient on this variable will be positive. As stated above, the low drop-out rate during the pilot period (i.e. after customers had received bills under CAP) prevented meaningful analysis of this hypothesis.

H7j: Customers whose rate comparison shows a cumulative gain will have a drop-out rate that is lower than customers who experience a cumulative loss.

This hypothesis could also be tested using a logit model in which the dependent variable is unity for customers who have dropped out of the program and zero for those who have not. The analysis would omit customers who terminated service during the course of the pilot. The independent variables would represent the several rate and technology treatments, the education treatments, and an indicator variable that equals unity if the customer's aggregate CAP bill is less than the customer's aggregate bill on its standard residential rate. The hypothesis is that the coefficient on this variable will be negative, indicating that customers who have paid less on CAP than they would otherwise have paid were less likely to drop out of the program. As stated above, the low drop-out rate during the pilot period (i.e. after customers had received bills under CAP) prevented meaningful analysis of this hypothesis.

H7k: Customers who experience sequential monthly losses will have a drop-out rate that is higher than customers who do not experience sequential monthly losses.

This hypothesis could be tested using the same method used to test hypothesis H7h, but it would include an explanatory variable that equals unity for customers who have experienced sequential monthly losses in two or more consecutive months. As stated above, the low drop-out rate during the pilot period (i.e. after customers had received bills under CAP) prevented meaningful analysis of this hypothesis.

Rate Comparisons

Hypotheses H7g and H7h address changes in customer behavior that may result from experiencing losses as portrayed on the rate comparisons. As is discussed above, the timing involved in these hypotheses make them particularly challenging to test: there is a lag between the time that electricity usage leading to a bill loss or gain takes place, the time when the customer is made aware of the loss or gain via a rate comparison, and the time that the customer adjusts their behavior in response to the loss or gain. Further, the wording of these hypotheses is imprecise and requires additional interpretation. For instance, H7g states that customers will "change their behavior in subsequent months", but does not indicate what behavior might change or how many subsequent months should be analyzed. For these reasons, we do not conduct formal tests of these hypotheses but instead describe methods that could be applied if these barriers were overcome.

Both hypotheses are stated below, along with descriptions of an approach to testing them according to customer behavior as measured by customer-specific elasticities of substitution.

H7g: Customers whose rate comparison shows a monthly loss will change their behavior in subsequent months to minimize that loss.

This hypothesis could be tested using results derived from our estimated customer-specific demand models. These demand models allow us to estimate elasticities of substitution between peak and off-peak electricity by day, and these can be averaged or otherwise combined for any specified rate type and time period. In this way, these estimated elasticities of substitution can be the dependent variable in a second-stage model. For example, the dependent variable in one of several second-stage models could be average monthly customer-level elasticities of substitution (where the month corresponds to each customer's billing month). The independent variables that are likely to be associated with changes in customer's elasticities of substitution may include those related to weather, customer fixed effects (which account for customer-specific factors that do not change during the sample timeframe, and therefore include rate type and technology type), time-based indicator variables (e.g., indicating month of the year), and a variable indicating whether the previous billing month represented a loss.

In conducting these tests, it is likely that a loss would be defined as a month in which the customer received a higher bill on its CAP rate that he/she would have received on its standard rate. Loss categories may also be introduced that separate small losses from larger losses (e.g., less than 10% vs. 10% or more). The hypothesis is that the coefficient on the loss variable will be positive, indicating a higher elasticity of substitution for customers who previously experienced a loss.

Such an analysis would require considerable forethought to recognize the data requirements.

H7h: Customers whose rate comparison shows a cumulative loss will change their behavior in subsequent months to minimize that loss.

A model to test this hypothesis could use the same data used to test hypothesis H7g, except that it would include an independent variable that equals unity if the customer has experienced a cumulative loss (i.e., where the sum of monthly CAP bills is higher than the sum of what those bills would have been under the flat rate), and zero otherwise. The hypothesis is that the coefficient on the variable that measures the cumulative loss is positive, indicating a higher elasticity of substitution for customers who have experienced a cumulative loss.

Normative Comparisons

Hypotheses H7l and H7m address the effects of normative comparisons on customer electricity usage behavior. Testing these hypotheses encounters some of the timing complications discussed above, but the primary obstacles to testing these hypotheses is that almost all customers received normative comparisons (OPOWER reports) leaving no appropriate control group. Furthermore, due to problems encountered in the pilot, the OPOWER reports were not consistently distributed to customers throughout the CAP time period.

Hypotheses H7l and H7m are stated below, and an approach to addressing H7m is outlined.

H7l: Customers receiving normative comparisons will experience greater energy efficiency, demand response, and load-shifting benefits than customers not receiving normative comparisons.

Because all customers who receive education also receive normative comparisons through OPOWER, this hypothesis cannot be distinguished from hypothesis H6a. Therefore, no separate test of this hypothesis was conducted.

H7m: Customers whose normative comparisons show them having higher electricity consumption than their neighbors will lower their electricity consumption.

This hypothesis could be tested using the main model with the addition of an indicator variable that takes on a value of unity for customers whose OPOWER report indicates that they have higher electricity consumption than their neighbors, and zero otherwise. The null hypothesis is that the coefficient on this variable will be negative. The required data were not available.

Customer Experience – Notifications

Except for customers in control applications F1 and F3, all CAP customers were notified of events by automated phone call (unless they choose to opt-out[50]); they may also have chosen to receive notification by email or text message. In addition, customers on the CPP, PTR, and DA-RTP rates were notified of high prices whenever an hourly price exceeded $0.13 per kWh.

H7n: Customers who are notified of events will experience greater energy efficiency, demand response, and load-shifting benefits than customers who are not notified.

As in some previous hypotheses, this is really a joint hypothesis, but each piece of it is tested separately. Thus, four summer and three non-summer regression models are specified where the dependent variable is one of the four main measures of electricity consumption. The test is based on the main model but includes an independent variable that indicates the share of events for which a customer was successfully notified.[51] The hypothesis is that the coefficient on this variable will be negative in each model.

Table A-24 presents results for energy efficiency and demand response. The constant coefficients represent the customer group whose customers face the flat rate, have SFNS housing, basic education, and eWeb technology. The coefficients on the notification variable indicate the impact of notification on usage. For six of the seven models, the standard errors on the coefficients for the notification variable imply that notification is a significant determinant of usage. Unfortunately, the findings are counterintuitive. The positive signs on all but one of the coefficients indicate that notification increases (rather than reduces) usage. It seems reasonable to suppose that this result reflects a selection effect (i.e., higher-use customers choosing to be notified) rather than a treatment effect.

In summary, the evidence does not support hypothesis H7n.

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[50] Over the course of the pilot, only about 200 customers who were eligible to receive notifications elected not to.

[51] For example, because there were seven events between June and September, the notification variable equals 0 if the customer was never successfully notified, 1/7 if the customer was successfully notified once, 2/7 if the customer was successfully notified of two events, and so on.

Table A-24
Impact of Notification on Usage[52]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.376**	**1.562**	**2.23**	**1.119**	**0.934**	**0.844**	**0.904**
	(0.047)	(0.059)	(0.091)	(0.022)	(0.036)	(0.034)	(0.015)
CPP	0.040	0.054	-0.005	0.002	0.035	**0.052**	0.016
	(0.033)	(0.041)	(0.057)	(0.014)	(0.027)	(0.026)	(0.011)
DA-RTP	0.062	**0.099**	0.099	**0.037**	0.022	0.035	0.017
	(0.036)	(0.045)	(0.063)	(0.016)	(0.029)	(0.028)	(0.012)
PTR	0.060	0.081	0.079	0.007	0.035	0.050	0.023
	(0.037)	(0.046)	(0.064)	(0.015)	(0.029)	(0.028)	(0.012)
TOU	0.068	0.062	0.071	-0.016	0.024	0.017	-0.018
	(0.037)	(0.046)	(0.065)	(0.015)	(0.030)	(0.029)	(0.012)
BIHD	-0.010	0.001	0.011	0.012	0.002	0.004	0.007
	(0.024)	(0.030)	(0.042)	(0.011)	(0.019)	(0.019)	(0.008)
AIHD	0.033	0.054	0.080	0.018	0.012	0.014	0.011
	(0.027)	(0.035)	(0.048)	(0.012)	(0.021)	(0.021)	(0.009)
PCT	0.013	-0.001	0.010	0.003	-0.016	-0.025	0.000
	(0.035)	(0.041)	(0.058)	(0.015)	(0.026)	(0.025)	(0.011)
Bill Protection	0.020	0.035	0.069	0.030	0.041	0.039	0.006
	(0.041)	(0.052)	(0.073)	(0.018)	(0.037)	(0.036)	(0.013)
Purchase Tech.	-0.056	-0.057	-0.082	0.001	-0.048	-0.043	-0.006
	(0.043)	(0.055)	(0.076)	(0.018)	(0.033)	(0.033)	(0.013)
# Event Notifications (#/7)	**0.113**	**0.143**	**0.207**	0.010	**0.05**	**0.036**	**-0.024**
	(0.023)	(0.029)	(0.041)	(0.010)	(0.018)	(0.018)	(0.008)
Educ./Notif.	**-0.160**	**-0.212**	**-0.374**	-0.017	-0.083	-0.057	**0.040**
	(0.059)	(0.073)	(0.109)	(0.027)	(0.047)	(0.045)	(0.019)
SFSH	0.045	0.063	-0.115	0.031	**1.394**	**1.377**	0.055
	(0.162)	(0.213)	(0.262)	(0.070)	(0.411)	(0.402)	(0.042)

[52] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-24 (continued)
Impact of Notification on Usage

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
MFNS	**-0.679**	**-0.868**	**-1.228**	**-0.152**	**-0.439**	**-0.413**	-0.001
	(0.016)	(0.020)	(0.028)	(0.008)	(0.013)	(0.012)	(0.007)
MFSH	**-0.687**	**-0.836**	**-1.188**	-0.057	**0.496**	**0.437**	-0.016
	(0.038)	(0.047)	(0.068)	(0.035)	(0.071)	(0.073)	(0.025)
Observations	5,778	5,778	5,778	5,778	5,471	5,471	5,471
R-squared	0.194	0.198	0.202	0.063	0.174	0.162	0.008

H7o: Customers who choose more than one notification media will experience greater energy efficiency, demand response, and load-shifting benefits than customers who do not.

This hypothesis test uses the model from hypothesis H7n, plus an indicator variable that equals unity for customers who have elected to receive notification through multiple media and zero otherwise. The null hypothesis is that the coefficient on this new variable will be negative in each model.

Table A-25 presents results for the seven regressions. The constant coefficients represent the customer group with a flat rate, eWeb technology, basic education, and SFNS housing. The coefficients on the dummy variables for Multiple Notification Methods (0 or 1) indicate the impact of multiple notification methods on usage. In all cases, the high standard errors on the coefficients for this variable implies that multiple notification methods is a not a significant determinant of usage in these periods.

Table A-25
Impact of Multiple Notification Methods on Usage[53]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.376**	**1.562**	**2.23**	**1.119**	**0.934**	**0.844**	**0.904**
	(0.047)	(0.059)	(0.091)	(0.022)	(0.036)	(0.034)	(0.015)
CPP	0.040	0.054	-0.003	0.003	0.034	0.052	0.017
	(0.033)	(0.041)	(0.058)	(0.014)	(0.027)	(0.026)	(0.011)
DA-RTP	0.062	**0.099**	0.100	**0.037**	0.022	0.035	0.017
	(0.036)	(0.045)	(0.063)	(0.016)	(0.029)	(0.028)	(0.012)
PTR	0.060	0.081	0.079	0.007	0.035	0.050	0.023
	(0.037)	(0.046)	(0.064)	(0.015)	(0.029)	(0.028)	(0.012)
TOU	0.068	0.062	0.071	-0.016	0.023	0.016	-0.018
	(0.037)	(0.046)	(0.065)	(0.015)	(0.030)	(0.029)	(0.012)
BIHD	-0.010	0.001	0.011	0.012	0.002	0.003	0.007
	(0.024)	(0.030)	(0.042)	(0.011)	(0.019)	(0.019)	(0.008)
AIHD	0.033	0.054	0.079	0.018	0.013	0.015	0.011
	(0.028)	(0.035)	(0.048)	(0.012)	(0.021)	(0.021)	(0.009)
PCT	0.014	-0.001	0.009	0.003	-0.016	-0.025	-0.000
	(0.035)	(0.041)	(0.058)	(0.015)	(0.026)	(0.025)	(0.011)
Bill Protection	0.020	0.035	0.069	0.030	0.040	0.039	0.006
	(0.041)	(0.052)	(0.073)	(0.018)	(0.037)	(0.036)	(0.013)

[53] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-25 (continued)
Impact of Multiple Notification Methods on Usage

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Purchase Tech.	-0.055	-0.057	-0.084	0.000	-0.047	-0.042	-0.006
	(0.044)	(0.055)	(0.076)	(0.018)	(0.033)	(0.033)	(0.013)
# Event Notifications (#/7)	**0.111**	**0.143**	**0.212**	0.012	**0.046**	0.032	**-0.023**
	(0.024)	(0.030)	(0.042)	(0.011)	(0.018)	(0.018)	(0.008)
Multiple Notification Methods (0 or 1)	0.010	-0.001	-0.026	-0.008	0.020	0.017	-0.005
	-0.023	(0.029)	(0.040)	(0.009)	(0.018)	(0.018)	(0.007)
Educ./Notif.	**-0.16**	**-0.212**	**-0.373**	-0.017	-0.084	-0.058	**0.04**
	(0.059)	(0.073)	(0.109)	(0.027)	(0.047)	(0.045)	(0.020)
SFSH	0.046	0.063	-0.116	0.031	**1.396**	**1.378**	0.055
	(0.162)	(0.213)	(0.262)	(0.070)	(0.411)	(0.402)	(0.042)
MFNS	**-0.679**	**-0.868**	**-1.228**	**-0.153**	**-0.439**	**-0.413**	-0.001
	(0.016)	(0.020)	(0.028)	(0.008)	(0.013)	(0.012)	(0.007)
MFSH	**-0.687**	**-0.836**	**-1.187**	-0.057	**0.496**	**0.437**	-0.016
	(0.038)	(0.047)	(0.068)	(0.035)	(0.071)	(0.073)	(0.025)
Observations	5,778	5,778	5,778	5,778	5,471	5,471	5,471
R-squared	0.194	0.198	0.202	0.063	0.174	0.162	0.009

H7p: Customers who view hourly pricing information online will experience greater energy efficiency, demand response, and load-shifting benefits than customers who do not.

The question of whether customers viewed hourly prices online was not adequately addressed in the CAP final survey and the requisite data were not available in the MVDB. Therefore, this hypothesis could not be tested.

Were the data or needed survey information available, this test would build upon the test of hypothesis H7m by including an indicator variable for customers who indicate that they have viewed hourly pricing information. It would also be possible to construct interaction variables between this variable and the indicator variables for rate treatment RTP, CPP, and PTR (which charge hourly prices) if any non-hourly customers view hourly prices. The interaction would indicate whether viewing the hourly prices has a larger effect when customers are charged those prices. The hypothesis would be that the coefficient on the price-viewing variables will be negative in each model. The data requirements to undertake this test are formidable, especially getting customers to recall if they viewed the data.

H7q: Customers who sign up one or more family members for notification will experience greater energy efficiency, demand response, and load-shifting benefits than customers who do not.

The question of whether customers requested that multiple family members receive notifications was not addressed in the CAP final survey nor was useful data available in the MVDB. Therefore, this hypothesis cannot be tested.

Were these data available, this test could build upon the test of hypothesis H7n by including an indicator variable for customers who signed up more than one family member to receive event and high price notifications. The hypothesis would be that the coefficient on this variable will be negative in each model.

Customer Experience – Customer Support

The final set of hypotheses relate to the nature and/or effect of CAP customers' experience in contacting the customer support center. The CAP customer support center is staffed by specially-trained individuals who provide telephone and email support. ComEd outsourced this function.

H7r: Customers who contact the customer support center will experience greater energy efficiency, demand response, and load-shifting benefits than customers who do not.

This test is based on the main model but adds an indicator variable that equals unity if the customer ever contacted the CAP customer support center and zero if it did not. The hypothesis is that the coefficient on the customer contact variable is negative in each model.

Table A-26 presents results for four summer and three non-summer regressions. The coefficients on the dummy variable for *Contact Call Center (0 or 1)* indicate the impact on usage of a customer who called, emailed, sent a letter, or left a message for the customer support center. Only the coefficient for this variable in the All Summer Hours model is statistically significant, however its sign is positive, contradicting the hypothesis and posing a counterintuitive result.

Table A-26
Impact of Customer Contacts on Usage[54]

	All Summer Hours	Summer Peak Hours	Event Hours	Summer P/O Ratio	All Non-summer Hours	Non-summer Peak Hours	Non-summer P/O Ratio
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Constant	**1.374**	**1.561**	**2.227**	**1.120**	**0.932**	**0.843**	**0.904**
	(0.047)	(0.059)	(0.091)	(0.022)	(0.036)	(0.035)	(0.015)
CPP	0.039	0.054	-0.005	0.004	0.033	0.051	0.015
	(0.033)	(0.041)	(0.058)	(0.014)	(0.027)	(0.026)	(0.011)
DA-RTP	0.060	**0.098**	0.097	**0.038**	0.021	0.034	0.016
	(0.036)	(0.045)	(0.063)	(0.016)	(0.030)	(0.028)	(0.012)
PTR	0.058	0.080	0.077	0.007	0.034	0.049	0.022
	(0.037)	(0.046)	(0.064)	(0.015)	(0.029)	(0.028)	(0.012)
TOU	0.064	0.059	0.065	-0.015	0.022	0.015	-0.019
	(0.037)	(0.046)	(0.065)	(0.015)	(0.030)	(0.029)	(0.012)
BIHD	-0.024	-0.010	-0.007	0.017	-0.008	-0.006	0.005
	(0.025)	(0.032)	(0.044)	(0.011)	(0.020)	(0.019)	(0.008)
AIHD	0.027	0.051	0.074	0.021	0.008	0.010	0.009
	(0.028)	(0.035)	(0.049)	(0.012)	(0.021)	(0.021)	(0.009)
PCT	0.005	-0.008	-0.001	0.006	-0.022	-0.031	-0.001
	(0.035)	(0.041)	(0.058)	(0.015)	(0.026)	(0.025)	(0.011)

[54] The dependent variable in each regression is indicated at the top of each column and defined in greater detail on pages A-1 and A-2 of this appendix. See Appendix B for further details.

Table A-26 (continued)
Impact of Customer Contacts on Usage

	All Summer Hours	**Summer Peak Hours**	**Event Hours**	**Summer P/O Ratio**	**All Non-summer Hours**	**Non-summer Peak Hours**	**Non-summer P/O Ratio**
Variable	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**	**Coef. (S.E.)**
Bill Protection	0.024	0.041	0.076	0.030	0.043	0.040	0.005
	(0.041)	(0.052)	(0.073)	(0.018)	(0.037)	(0.036)	(0.013)
Purchase Tech.	-0.042	-0.045	-0.063	-0.003	-0.039	-0.035	-0.005
	(0.044)	(0.056)	(0.076)	(0.018)	(0.033)	(0.033)	(0.013)
Contact Call Center (0 or 1)	**0.053**	0.045	0.071	-0.015	0.033	0.031	0.004
	(0.022)	(0.028)	(0.039)	(0.009)	(0.017)	(0.016)	(0.007)
Educ./Notif.	-0.075	-0.106	**-0.221**	-0.010	-0.045	-0.030	0.023
	(0.057)	(0.071)	(0.106)	(0.026)	(0.045)	(0.043)	(0.018)
SFSH	0.059	0.082	-0.088	0.033	**1.395**	**1.376**	0.053
	(0.164)	(0.215)	(0.266)	(0.069)	(0.410)	(0.401)	(0.043)
MFNS	**-0.679**	**-0.868**	**-1.228**	**-0.153**	**-0.439**	**-0.412**	-0.000
	(0.016)	(0.020)	(0.028)	(0.008)	(0.013)	(0.012)	(0.007)
MFSH	**-0.698**	**-0.848**	**-1.206**	-0.057	**0.492**	**0.433**	-0.014
	(0.038)	(0.047)	(0.068)	(0.035)	(0.071)	(0.072)	(0.025)
Observations	5,778	5,778	5,778	5,778	5,471	5,471	5,471
R-squared	0.192	0.195	0.199	0.063	0.173	0.162	0.007

H7s: Customers on the CPP rate will contact the customer support center more frequently than customers on other rates.

This hypothesis is tested using a Poisson regression model, which is appropriate when the dependent variable is a count variable.[55] The dependent variable is the number of times the customer has contacted the customer support center. The independent variables represent the rate and technology treatments. Because dummy variables are specified to represent all rate treatments except for CPP, which is the control group, the hypothesis is that the coefficients on the dummy variables for the rate treatments will all be negative, indicating that customers on the other rates have contacted the customer support center less frequently than have CPP customers.

Table A-27 presents the results. The constant coefficient is equal to the natural log of 0.12 suggesting that on average CPP customers with eWeb and SFNS housing contacted the customer support center 0.12 times throughout the pilot. The other coefficients indicate how customers in the other rate or technology treatment groups differ from CPP customers with eWeb and SFNS housing. The small standard errors for the coefficients on the dummy variables for most of the rate treatment variables indicate that rate treatments do significantly affect the number of contacts. Thus, the evidence supports the hypothesis.

Furthermore, as might be expected, the coefficients for the technology treatment indicators (BIHD, AIHD, and PCT) are all positive and statistically significant. This may be because customers with those technologies must call customer support to activate the device and are probably more likely to need technical support.

[55] According to Greene (*Econometric Analysis*. 5th edition, Englewood Cliffs, NJ: Prentice Hall, Inc., 2003, Chapter 21), one could use ordinary linear regression to conduct the analysis when the dependent variable consists of count data. Nonetheless, because of the number of zeros, and very small values, and the discrete nature of the data, one can improve on the results by specification of a model that accounts specifically for these characteristics of the dependent variable. The Poisson model is widely used for this purpose. It specifies that each of the dependent variables is drawn from a Poisson distribution rather than a normal distribution.

Table A-27
Impact of Rate on Number of Customer Contacts[56]

Variable	Coef.	(S.E)
Constant	-2.155	(0.312)
FLR	-0.615	(0.114)
DA-RTP	-0.309	(0.080)
IBR	-0.403	(0.099)
PTR	-0.275	(0.088)
TOU	-0.066	(0.095)
BIHD	1.610	(0.093)
AIHD	1.325	(0.108)
PCT	1.399	(0.133)
Bill Protection	0.332	(0.167)
Purchase Tech.	-1.142	(0.181)
Educ./Notif.	0.477	(0.316)
SFSH	0.188	(0.477)
MFNS	-0.340	(0.064)
MFSH	0.391	(0.177)
Observations	7,847	
R-squared	0.0806	

H7t: Customers on the CPP rate will have call durations that are longer than the durations for customers on other rates.

This hypothesis is tested using a Poisson regression model in which the dependent variable is the call duration. Because dummy variables are specified to represent all rate treatments except for CPP (i.e. CPP is the control group), the hypothesis is that the coefficients on the dummy variables for the rate treatments will be negative, indicating that customers in the other rate treatments have contacted the customer support center for shorter durations than did CPP customers.

Table A-28 presents results in which the constant coefficient represents the average call duration (in seconds) by the control group, CPP customers with eWeb and SFNS housing. The other coefficients indicate how average call durations differ for customers with other rate and technology treatments from those in the control group. Only customers with enabling technologies (BIHD,

[56] The dependent variable is a count variable that equals the number of times the customer contacted the customer support center. Please see Appendix B for this addendum for additional details.

AIHD, or PCT) are included in the sample. The negative signs and small standard errors on the coefficients for variables representing the DA-RTP and IBR rate treatments indicate that call durations for customers on those rates are significantly shorter than for customers on the CPP rate (all else equal). Thus, the evidence partially supports the hypothesis.

Table A-28
Impact of Rate and Technology on Call Duration[57]

Variable	Coef.	(S.E)
Constant	179.114	(27.267)
FLR	-22.447	(23.193)
DA-RTP	-35.469	(15.918)
IBR	-46.277	(18.369)
PTR	-26.941	(16.408)
TOU	-31.826	(17.056)
BIHD	46.735	(22.780)
AIHD	31.441	(24.674)
PCT	25.624	(28.213)
Bill Protection	-6.286	(39.067)
Purchase Tech.	-58.711	(27.026)
Educ./Notif.	130.379	(33.082)
SFSH	62.733	(81.178)
MFNS	0.847	(11.587)
MFSH	26.151	(28.512)
Event	-60.982	(22.073)
Observations	2,874	
R-squared	0.010	

H7u: Customers who are eligible to receive the BIHD will contact the customer support center more frequently than customers eligible to receive other enabling technology.

The model used to test this hypothesis is similar to that which was used to test hypothesis H7s except that, to measure contacts relative to BIHD, the independent variables were rearranged so that the constant coefficient represents the number of contacts by flat rate customers with BIHD and SFNS housing. Consequently, the hypothesis is that the coefficients on the technology variables

[57] Dependent variable: variable indicating the length of calls placed to the customer support center in seconds. Please see Appendix B for this addendum for additional details.

are negative. In keeping with the wording of the hypothesis, the technology variables include all customers in the treatment cells rather than only those who implemented and/or adopted the technology.

In Table A-29 the small standard error for the coefficient corresponding to AIHD technology suggests that the number of calls is significantly fewer for customers eligible to receive AIHD as compared to those eligible to receive BIHD (all else equal). There is no significant difference for customers eligible to receive PCT. Therefore, hypothesis H7u is partially supported by the evidence.

Table A-29
Impact of Technology on Number of Customer Contacts[58]

Variable	Coef.	(S.E)
Constant	-0.645	(0.110)
CPP	0.563	(0.120)
DA-RTP	0.266	(0.123)
IBR	0.175	(0.136)
PTR	0.293	(0.130)
TOU	0.516	(0.132)
AIHD	-0.284	(0.077)
PCT	-0.200	(0.111)
Purchase Tech.	-1.148	(0.182)
SFSH	0.252	(0.476)
MFNS	-0.337	(0.068)
MFSH	0.408	(0.195)
Observations	5,532	
R-squared	0.0286	

H7v: Customers who are eligible to receive the BIHD will have call durations that are longer than durations for customers eligible to receive other enabling technology.

The model used to test this hypothesis is similar to that which was used to test hypothesis H7t except that, to measure call durations relative to BIHD, the independent variables were rearranged so that the constant coefficient represents the call duration for flat rate customers with BIHD technology and SFNS housing. Consequently, the hypothesis is that the coefficients on the technology variables are negative. In keeping with the wording of the hypothesis, the

[58] The dependent variable is a count variable that equals the number of times the customer contacted the customer support center. Please see Appendix B for this addendum for additional details.

technology variables include all customers in the treatment cells rather than only those who implemented and/or adopted the technology.

The results presented in Table A-30 suggest that neither the AIHD nor the PCT treatment significantly affected call durations when compared to call durations for customers eligible to receive the BIHD (all else equal). Therefore, the evidence does not support the hypothesis.

Table A-30
Impact of Rate and Technology on Call Duration[59]

Variable	Coef.	(S.E)
Constant	333.301	(22.093)
CPP	18.189	(24.003)
DA-RTP	-12.091	(24.758)
IBR	-18.858	(26.405)
PTR	-4.246	(25.307)
TOU	-8.582	(25.311)
AIHD	-14.834	(13.180)
PCT	-18.094	(19.357)
Purchase Tech.	-60.768	(27.209)
SFSH	64.587	(81.128)
MFNS	1.645	(12.199)
MFSH	30.349	(30.399)
Event	-52.960	(25.773)
Observations	2,664	
R-squared	0.006	

H7w: Customer satisfaction with customer support center will exceed satisfaction levels of ComEd's customer care center.

The test of this hypothesis relies on information about customer satisfaction with the CAP customer support center obtained in the CAP final survey. Unfortunately, the final survey did not directly inquire about customer satisfaction with ComEd's customer care center and only indirectly addressed satisfaction with the customer support center. As a result, this hypothesis could not be directly tested. Instead we run a linear regression measuring the effects of treatments on satisfaction with the support center as measured by question 19b on the CAP final survey. That question asks customers to rank their

[59] The dependent variable is the length of calls placed to the customer support center, in seconds.

disagreement or agreement (from zero to 10, respectively) with the statement that "the Smart Tools call center easy to do business with."

The model is a linear regression where the dependent variable equals each customer's response to question 19b and the independent variables account for various rate and technology treatments. Table A-31 presents the results of this regression. The control group consists of customers in the omitted categories – customers on the IBR rate, with eWeb technology, and SFNS housing. The only coefficients with standard errors small enough to yield statistically significant results are for the technology treatments. When compared to customers with eWeb technology (all else equal), customers eligible to receive BIHD, AIHD, and PCTs were all more satisfied with the customer support center.

Table A-31
Impact of Rate and Technology on Customer Satisfaction with Customer Support Center[60]

Variable	Coef.	(S.E)
Constant	3.446	(1.150)
FLR	0.266	(0.897)
CPP	0.746	(0.810)
DA-RTP	0.978	(0.842)
PTR	0.953	(0.876)
TOU	0.032	(0.864)
BIHD	0.982	(0.435)
AIHD	1.359	(0.501)
PCT	1.788	(0.703)
Bill Protection	-0.530	(0.765)
Purchase Tech.	-0.374	(0.801)
Educ./Notif.	-0.081	(0.896)
SFSH	2.099	(1.756)
MFNS	-0.258	(0.366)
MFSH	-1.083	(0.754)
Observations	478	
R-squared	0.056	

[60] Dependent variable: variable indicating the customer's response to question 19b on the CAP final survey. Please see Appendix B for this addendum for additional details.

Appendix B: Technical Summaries

Statistical estimates are presented in tables throughout the Phase 2 Analysis Report[61] and Appendix A of this addendum. To facilitate the replication of results, this Appendix B provides output from the statistical software (Stata) corresponding to each of those tables. The first section defines the variable labels found in the Stata output. The second section describes the criteria used to filter data (i.e., eliminate customers from the analysis because of missing or unreliable data). The final section presents the Stata output tables in the order in which they appear in the Phase 2 Analysis Report and Appendix A of this addendum.

Throughout this appendix, unless otherwise specified, "Summer" refers to the period from June 11, 2010 to September 30, 2010; and "Non-Summer" refers to the period from October 2, 2010 to April 27, 2011.[62]

Variable Definitions

The variable labels defined below frequently appear in the Stata output tables and/or are referenced in the summaries:

Dependent Variables

- usage
  Average hourly kW usage for all days from June 11 through September 30, 2010 in Summer models and from October 2, 2010, through April 27, 2011 in Non-Summer models.
- peak
  Average hourly kW usage during peak hours (1:00pm to 5:00pm) on non-holiday weekdays from June 11 through September 30, 2010 in Summer models and from October 2, 2010, through April 27, 2011 in Non-Summer models.

[61] *The Effect on Electricity Consumption of the Commonwealth Edison Customer Application Program: Phase 2 Final Analysis.* EPRI, Palo Alto, CA: 2011. 1023644.

[62] As was noted in the Phase 2 report, one exception to the summer time period is August 3, 2010, where the data indicate an outage for customers in only some of the rate treatments. As such, this date is omitted from the ANOVA analyses. This was likely due to a technical error in data collection rather than an actual outage.

- event_peak
  Average hourly kW usage during peak hours (1:00pm to 5:00pm) on event days.
- peak_offpeak
  Average peak hourly usage divided by average off-peak hourly usage on non-holiday weekdays from June through August 2010.
- ln_kwh
  Natural log of average hourly peak-period kWh.
- ln_avg_usage
  Natural log of usage (in kWh/hour) during a specific billing month averaged across customers in the IBR treatment cells.
- optout
  Binary choice variable that equals one if the customer opted out of the pilot program and zero otherwise.
- implement
  Binary choice variable that equals one if the customer implemented the technology and zero otherwise.
- satisfaction
  Average of customer responses to questions 22 and 23 on the CAP final survey, where each score can be any integer from zero to 10.
- adoption
  Binary choice variable that equals one if the customer adopted the technology and zero otherwise.
- contacts
  Count variable that equals the number of times the customer has contacted the customer support center.
- callduration
  Variable indicating the length of calls placed to the customer support center in seconds.
- cc_satisfa~n
  Variable from zero to 10 indicating the customers response to question 19b on the CAP final survey.

Independent Variables

- Rate type indicators equal one if the customer is subject to a particular rate structure and equal zero otherwise.
  - cpp corresponds to the critical peak pricing rate structure.
  - dap corresponds to the day-ahead real-time pricing rate structure.
  - flr corresponds to the flat rate structure.
  - ibr corresponds to the inclining block rate structure.
  - ptr corresponds to the peak-time rebate rate structure.
  - tou corresponds to the time-of-use pricing rate structure.

- Technology type indicators equal one if the customer is in a treatment cell that offers a particular technology and equal zero otherwise.
  - bihd
    corresponds to the Basic In-Home Display (BIHD) treatment cells.
  - aihd
    corresponds to the Advanced In-Home Display (AIHD) treatment cells.
  - pct
    corresponds to the Advanced In-Home Display plus Programmable Communicating Thermostat (AIHD/PCT) treatment cells.
  - eweb corresponds to the Enhanced Web (eWeb) treatment cells.

- Technology implementation indicators that are interactions between the technology variables and whether the customer implemented (i.e., installed) the technology. These variables equal one if the customer is in a treatment cell offering a particular technology *and* the customer implemented (i.e. installed) the technology, and equal zero otherwise.
  - bihd_imp
    corresponds to customers in a BIHD treatment cell who have installed their device.
  - aihd_imp
    corresponds to customers in an AIHD treatment cell who have installed their device.
  - pct_imp
    corresponds to customers in an AIHD/PCT treatment cell who have installed their devices.

- Housing type indicators equal one if the customer resides in a particular class of residential housing and equal zero otherwise.
  - SFNS
    corresponds to customers in single-family residences with no space heating.
  - SFSH
    corresponds to customers in single-family residences with space heating.
  - MFNS
    corresponds to customers in multi-family residences with no space heating.
  - MFSH
    corresponds to customers in multi-family residences with space heating.

- Cell type indicators equal one if the customer is in a particular treatment cell and equal zero otherwise.
  - d1 corresponds to customers in treatment cell D1a.
  - l1 corresponds to customers in treatment cell L1a.
  - l5 corresponds to customers in treatment cell L5a.
  - l6 corresponds to customers in treatment cell L6a.
  - f6_or_f7
    corresponds to customers in treatment cells F6 or F7.

- All other variable labels match the treatment cells as outlined in the report.

▪ Event-day indicators equal one on the specified event-day(s) and equal zero otherwise.

- event7
  corresponds to the seventh event-day, September 21, 2010
- event_day_~d
  corresponds to all event days; July 14, July 23, July 27, August 19, August 20, August 31, and September 21, 2010.

▪ Day-type and month-type indicators equal one on a specified day or month and equal zero otherwise.

- dt2 corresponds to Tuesdays.
- dt3 corresponds to Wednesdays.
- dt4 corresponds to Thursdays.
- dt5 corresponds to Fridays.
- m7 corresponds to July.
- m8 corresponds to August .
- m9 corresponds to September.

▪ Weather variables identify temperature and humidity conditions during a particular time period.

- peak_thi
  Average hourly peak-period Temperature-Humidity Index (THI), where THI = (0.55 * average temperature) + (0.2 * average dewpoint) + 17.5.
- prepeak_thi Average hourly THI between 10:00am and 1:00pm.
- morn_thi Average hourly THI between midnight and 10:00am.
- lag1_thi Average hourly THI from the previous day.
- peak_thi2 Square of average hourly peak-period THI.
- prepeak_thi2
  Square of average hourly THI between 10:00am and 1:00pm.
- morn_thi2
  Square of average hourly THI between midnight and 10:00am.
- lag1_thi2 Square of average hourly THI from the previous day.
- peak_cdh65
  Average peak-period cooling degree hours (CDH) using 65 degrees as the baseline value.
- prepeak_c~65 Average CDH between 10:00am and 1:00pm.
- morn_cdh65 Average CDH between midnight and 10:00am.
- lag1_cdh65 Average CDH from the previous day.
- peak_cdh652 Square of average peak-period CDH.
- prepeak_c~652 Square of average CDH between 10:00am and 1:00pm.
- morn_cdh652 Square of average CDH between midnight and 9:00am.
- lag1_cdh652 Square of average CDH from the previous day.
- avg_cdd
  Average cooling degree days during a typical (average) bill month using 65 degrees as the baseline value.

- avg_hdd
  Average heating degree days during a typical (average) bill month using 65 degrees as the baseline value.

- Other treatment conditions are identified using indicators that equal one when the customer satisfies the particular condition and equal zero otherwise.

  - bill_prot
    corresponds to customers who were notified of bill protection.
  - purch_tech
    corresponds to customers who were offered the opportunity to purchase enabling technology.
  - full_educ
    corresponds to customers who received education beyond the basic education offered to customers in cell F3.
  - notify_share
    corresponds to the share of events for which a customer was successfully notified (i.e., it can equal 0, 1/7, 2/7, etc.).
  - methods
    corresponds to customers who have elected to receive notification through multiple media.
  - anycontact
    corresponds to customers who ever contacted the CAP customer support center.
  - event
    corresponds to event days in models where the observations are date-specific.
  - direct
    corresponds to customers who engaged in direct feedback solutions only.
  - indirect
    corresponds to customers who engaged in indirect feedback solutions only.
  - direct_ind~t
    corresponds to customers who engaged in both direct and indirect feedback solutions.
  - small_steps
    equals an integer from zero to eight depending upon the number of small observable steps the customer engaged in.
  - steps_dummy
    corresponds to customers who engaged in any small observable steps.

- The constant in the regression equation is represented by _cons.

Data Filtering

Due to technical problems with the collection of electricity usage data from CAP customers, data for some customers could not be used in the Phase 2 analysis. In some cases, the problems were isolated to individual customers, but often the issues could be categorized and applied to larger groups of customers. Throughout the analysis we applied several *filters* to the data in order to screen out these data problems. Because all models were evaluated over the summer and non-summer time periods separately, there are separate filters for each period.

Different models required different levels of data screening. For instance, because the ANOVA models contain one observation for each customer and because weather is not included, it is necessary that each customer's observation represents an aggregation of usage data over the same time period. Therefore, the ANOVA filter is distinct in that it requires complete data over the specified time period. In contrast, because the fixed-effects model contains daily observations for each customer in addition to weather variables, it does not require each customer to have full data for the relevant time period.[63]

There were six primary criteria used to screen the data. Table B-1 below details the criteria and the number of non-F1/F2 customers that were filtered as a result of each.[64] Filter A was used for the ANOVA, NCES, and GL models. Filter B was applied for the fixed-effects model and the model used to find the average estimated load impact for responders (page 5-26 of Phase 2 report).

Table B-1
Number of Customers Filtered from Electricity Usage Data

	Filter A		**Filter B**
	Summer	**Non-Summer**	**Summer**
Total non-F1 or F2 customers with data	**7380**	**7044**	**7380**
High share of zeroes – Usage data contains >2% values equal to zero	543	257	543
Incomplete data – Usage data contains holes or missing hours	264	455	
Customers opt-out of CAP	94	86	133
High frequency of repeating values – Technical problems in the usage data as indicated by >200 instances of 3 hours in a row of identical kWh	48	57	57
Multiple instances of unrealistically high kWh values	33	18	34
Finaled (and not caught in incomplete data filter)	1	118	150
Total # filtered	983	991	917
Total % filtered	13%	14%	12%

[63] However, we do continue to screen customers who had terminated service (finaled) by the end of the relevant time period.

[64] Note that customers could have fulfilled more than one filtering criteria, but the counts in the table reflect each filtered customer being counted once.

Phase 2 Report Tables

Output from each statistical model that contributed to the results presented in the Phase 2 report is shown below. The results are organized according to the table numbers from the Phase 2 report.

Table 5-1 Estimated Coefficients from the Summer ANOVA Models[65]

Table 5-1 contains results from the four models detailed below. Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage.

```
Linear regression                                      Number of obs =    5778
                                                       F( 13,  5764) =  140.50
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1908
                                                       Root MSE      =  .67715

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0438367   .0332756     1.32   0.188    -.0213959    .1090693
         dap |   .0631761   .0360335     1.75   0.080    -.0074631    .1338153
         ptr |   .0605055   .0369629     1.64   0.102    -.0119556    .1329666
         tou |   .0687044   .0372524     1.84   0.065    -.0043243    .1417331
        bihd |  -.0067263   .0242201    -0.28   0.781    -.0542069    .0407542
        aihd |    .036752   .0274435     1.34   0.181    -.0170476    .0905516
         pct |   .0143969   .0346126     0.42   0.677    -.0534568    .0822506
   bill_prot |   .0242882   .0412734     0.59   0.556    -.0566233    .1051996
  purch_tech |  -.0550892   .0435824    -1.26   0.206    -.1405271    .0303487
   full_educ |  -.0768751   .0569643    -1.35   0.177    -.1885465    .0347964
        SFSH |   .0608919   .1635426     0.37   0.710    -.2597131    .3814968
        MFNS |   -.681744   .0163047   -41.81   0.000    -.7137075   -.6497806
        MFSH |  -.6947426   .0381425   -18.21   0.000    -.7695162   -.6199689
       _cons |   1.376989   .0471172    29.22   0.000     1.284622    1.469357
------------------------------------------------------------------------------
```

[65] Table 5-1 can be found on page 5-5 of EPRI 1023644.

- Linear regression model using robust standard errors where the dependent variable is peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 13,  5764) =  149.93
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1949
                                                       Root MSE      =  .85259

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |    .058554   .0410716     1.43   0.154    -.0219617    .1390697
         dap |   .1008382   .0451884     2.23   0.026     .0122519    .1894245
         ptr |    .082068   .0462535     1.77   0.076    -.0086063    .1727422
         tou |   .0627371   .0459909     1.36   0.173    -.0274223    .1528965
        bihd |   .0047288   .0305293     0.15   0.877    -.0551201    .0645777
        aihd |   .0592565   .0347762     1.70   0.088    -.0089179    .1274309
         pct |   .0006117   .0413959     0.01   0.988    -.0805397    .0817632
   bill_prot |   .0408943   .0518402     0.79   0.430    -.0607318    .1425205
  purch_tech |  -.0560664   .0552798    -1.01   0.311    -.1644356    .0523028
   full_educ |  -.1074225   .0707728    -1.52   0.129    -.2461637    .0313188
        SFSH |   .0831851   .2141098     0.39   0.698    -.3365506    .5029207
        MFNS |  -.8704187   .0200549   -43.40   0.000     -.909734   -.8311035
        MFSH |  -.8460358    .046673   -18.13   0.000    -.9375325   -.7545391
       _cons |   1.563471     .05892    26.54   0.000     1.447966    1.678977
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 13,  5764) =  153.32
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1988
                                                       Root MSE      =  1.1927

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0017062   .0577115     0.03   0.976      -.11143    .1148423
         dap |   .1015057    .063502     1.60   0.110    -.0229822    .2259935
         ptr |   .0804983   .0644706     1.25   0.212    -.0458884    .2068849
```

tou	.0709674	.0651602	1.09	0.276	-.056771	.1987057
bihd	.0164468	.0423197	0.39	0.698	-.0665158	.0994093
aihd	.0866684	.0483536	1.79	0.073	-.0081228	.1814597
pct	.0115838	.0580159	0.20	0.842	-.1021492	.1253167
bill_prot	.0769908	.0731636	1.05	0.293	-.0664374	.220419
purch_tech	-.0809135	.0757414	-1.07	0.285	-.2293951	.0675681
full_educ	-.2226392	.1058271	-2.10	0.035	-.4301001	-.0151784
SFSH	-.0862252	.2644919	-0.33	0.744	-.6047287	.4322783
MFNS	-1.232025	.028009	-43.99	0.000	-1.286933	-1.177116
MFSH	-1.202139	.0676078	-17.78	0.000	-1.334676	-1.069603
_cons	2.231532	.0911892	24.47	0.000	2.052767	2.410297

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 13,  5764) =   31.05
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0628
                                                       Root MSE      =  .28899
```

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0025945	.0139017	0.19	0.852	-.0246581	.0298472
dap	.0366941	.0155951	2.35	0.019	.0061218	.0672664
ptr	.0067823	.0149893	0.45	0.651	-.0226024	.036167
tou	-.0161976	.0153766	-1.05	0.292	-.0463416	.0139464
bihd	.0121792	.0106368	1.15	0.252	-.0086728	.0330313
aihd	.0186114	.0116592	1.60	0.110	-.0042451	.0414678
pct	.0030235	.0145582	0.21	0.835	-.025516	.0315629
bill_prot	.0301295	.0178623	1.69	0.092	-.0048873	.0651462
purch_tech	.0010502	.0183482	0.06	0.954	-.0349191	.0370195
full_educ	-.0094741	.0260671	-0.36	0.716	-.0605754	.0416272
SFSH	.0324893	.06946	0.47	0.640	-.1036785	.1686571
MFNS	-.1526917	.0079561	-19.19	0.000	-.1682886	-.1370947
MFSH	-.0580946	.035337	-1.64	0.100	-.1273684	.0111792
_cons	1.118611	.0223369	50.08	0.000	1.074822	1.162399

Table 5-2 Estimated Coefficients from the Non-Summer ANOVA Models[66]

Table 5-2 contains results from the three models detailed below. Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage.

```
Linear regression                                      Number of obs =    5471
                                                       F( 13,  5457) =  105.92
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1728
                                                       Root MSE      =  .51384

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0367876   .0274151     1.34   0.180     -.016957    .0905322
         dap |    .023554   .0295083     0.80   0.425     -.034294    .0814021
         ptr |   .0349458   .0289368     1.21   0.227    -.0217818    .0916734
         tou |   .0248327   .0303454     0.82   0.413    -.0346565    .0843218
        bihd |   .0033768   .0190667     0.18   0.859    -.0340016    .0407552
        aihd |   .0141961    .021163     0.67   0.502    -.0272918     .055684
         pct |  -.0158206   .0261871    -0.60   0.546    -.0671577    .0355165
   bill_prot |   .0425891   .0365079     1.17   0.243     -.028981    .1141591
  purch_tech |  -.0475397   .0329965    -1.44   0.150     -.112226    .0171466
   full_educ |  -.0461952   .0446643    -1.03   0.301    -.1337549    .0413646
        SFSH |   1.398966    .410241     3.41   0.001     .5947298    2.203202
        MFNS |  -.4407038   .0126199   -34.92   0.000    -.4654438   -.4159639
        MFSH |   .4930687   .0709546     6.95   0.000     .3539694     .632168
       _cons |   .9339743   .0355045    26.31   0.000     .8643714    1.003577
------------------------------------------------------------------------------
```

[66] Table 5-2 can be found on page 5-7 of EPRI 1023644.

- Linear regression model using robust standard errors where the dependent variable is peak.

```
Linear regression                                      Number of obs =    5471
                                                       F( 13,  5457) =   97.23
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1615
                                                       Root MSE      =   .5026

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0536889   .0263949     2.03   0.042     .0019443    .1054336
         dap |   .0356171   .0283384     1.26   0.209    -.0199375    .0911717
         ptr |   .0503471   .0277763     1.81   0.070    -.0041056    .1047998
         tou |    .017267   .0290992     0.59   0.553    -.0397789     .074313
        bihd |   .0046209   .0187697     0.25   0.806    -.0321752     .041417
        aihd |    .015775   .0210328     0.75   0.453    -.0254576    .0570077
         pct |  -.0252307   .0251335    -1.00   0.315    -.0745023     .024041
   bill_prot |   .0403582   .0363083     1.11   0.266    -.0308207     .111537
  purch_tech |  -.0426725    .032639    -1.31   0.191     -.106658     .021313
   full_educ |  -.0311113   .0432479    -0.72   0.472    -.1158945    .0536719
        SFSH |    1.38005   .4014583     3.44   0.001     .5930319    2.167068
        MFNS |  -.4140417   .0123408   -33.55   0.000    -.4382347   -.3898487
        MFSH |   .4346936   .0726003     5.99   0.000      .292368    .5770192
       _cons |   .8446697   .0344656    24.51   0.000     .7771034     .912236
------------------------------------------------------------------------------
```

Linear regression model using robust standard errors where the dependent variable is peak_offpeak.

```
Linear regression                                      Number of obs =    5471
                                                       F( 13,  5457) =    3.01
                                                       Prob > F      =  0.0002
                                                       R-squared     =  0.0067
                                                       Root MSE      =  .20416

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0156775   .0113494     1.38   0.167     -.006572    .0379269
         dap |   .0167572   .0119674     1.40   0.161    -.0067036    .0402179
         ptr |   .0224681    .011855     1.90   0.058    -.0007724    .0457087
         tou |  -.0183263   .0122963    -1.49   0.136    -.0424319    .0057793
        bihd |   .0059352   .0078276     0.76   0.448    -.0094101    .0212804
```

```
        aihd |   .0101619   .0086948     1.17   0.243    -.0068835    .0272072
         pct |  -.0000368   .0107367    -0.00   0.997    -.0210851    .0210115
   bill_prot |   .0049731    .012595     0.39   0.693    -.0197181    .0296643
  purch_tech |  -.0059502   .0130724    -0.46   0.649    -.0315773     .019677
   full_educ |   .0223814   .0184685     1.21   0.226    -.0138243    .0585871
        SFSH |   .0530838   .0425152     1.25   0.212     -.030263    .1364305
        MFNS |  -.0006674   .0067494    -0.10   0.921    -.0138988    .0125641
        MFSH |  -.0142835   .0247994    -0.58   0.565    -.0629001    .0343332
       _cons |   .9040381   .0150896    59.91   0.000     .8744565    .9336197
------------------------------------------------------------------------------
```

Table 5-3 Event-Day Load Impact Estimates by Rate Type[67]

Table 5-3 contains results from the three models detailed below where each is a linear fixed-effects model with first-order autoregressive disturbances. The models contain one observation per non-holiday weekday for each customer within a specified rate treatment group (CPP, PTR or FLR). The dependent variable in each model is `ln_kwh` as defined above.

- CPP Customers

```
FE (within) regression with AR(1) disturbances  Number of obs      =    158859
Group variable: billaccountnum                  Number of groups   =      1896

R-sq:  within  = 0.1842                         Obs per group: min =        20
       between = 0.0005                                        avg =      83.8
       overall = 0.0934                                        max =        85

                                                F(17,156946)       =   2084.41
corr(u_i, Xb)  = 0.0004                         Prob > F           =    0.0000

------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |   .0020267   .0063444     0.32   0.749    -.0104083    .0144617
      event7 |   -.174486   .0129841   -13.44   0.000    -.1999346   -.1490374
    peak_thi |  -.0385069   .0171097    -2.25   0.024    -.0720417   -.0049722
 prepeak_thi |   .0133224   .0182935     0.73   0.466    -.0225324    .0491772
    morn_thi |  -.0561192   .0107302    -5.23   0.000    -.0771501   -.0350883
    lag1_thi |   .0066078    .008421     0.78   0.433    -.0098972    .0231128
   peak_thi2 |   .0003228   .0001156     2.79   0.005     .0000962    .0005493
prepeak_thi2 |    .000067   .0001254     0.53   0.593    -.0001789    .0003129
   morn_thi2 |    .000488   .0000822     5.94   0.000     .0003268    .0006492
   lag1_thi2 |   .0000911    .000062     1.47   0.142    -.0000304    .0002127
         dt2 |  -.0509658   .0084306    -6.05   0.000    -.0674897   -.0344419
         dt3 |  -.0623147   .0127519    -4.89   0.000    -.0873082   -.0373212
```

[67] Table 5-3 can be found on page 5-14 of EPRI 1023644.

```
         dt4 |  -.0806355   .0144515    -5.58   0.000    -.1089601   -.0523108
         dt5 |  -.0618504   .0152661    -4.05   0.000    -.0917717   -.0319292
          m7 |   .0887077   .0060148    14.75   0.000     .0769189    .1004965
          m8 |   .0363456   .0060086     6.05   0.000     .0245689    .0481223
          m9 |  -.1078873   .0063998   -16.86   0.000    -.1204307   -.0953439
       _cons |   .1167693   .0290589     4.02   0.000     .0598144    .1737241
-------------+----------------------------------------------------------------
      rho_ar |  .41718594
     sigma_u |  .91557033
     sigma_e |  .51798515
     rho_fov |  .75753295   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1895,156946) =   105.77         Prob > F = 0.0000
```

- PTR Customers

```
FE (within) regression with AR(1) disturbances  Number of obs      =    158859
Group variable: billaccountnum                  Number of groups   =      1896
R-sq:  within  = 0.1447                         Obs per group: min =        20
       between = 0.0001                                        avg =      83.8
       overall = 0.0386                                        max =        85
                                                F(13,156950)       =   2041.93
corr(u_i, Xb)  = -0.0004                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |   .0753873   .0055314    13.63   0.000     .0645458    .0862288
      event7 |  -.0108171   .0130534    -0.83   0.407    -.0364015    .0147672
    peak_thi |  -.0021315   .0009417    -2.26   0.024    -.0039773   -.0002857
 prepeak_thi |   .0167918   .0010575    15.88   0.000     .0147191    .0188644
    morn_thi |   .0113215   .0006803    16.64   0.000     .0099881     .012655
    lag1_thi |   .0002445   .0004957     0.49   0.622     -.000727     .001216
         dt2 |   .4409316   .0062823    70.19   0.000     .4286183    .4532449
         dt3 |   .7397713   .0087414    84.63   0.000     .7226383    .7569043
         dt4 |   .8196106   .0099937    82.01   0.000     .8000232     .839198
         dt5 |   .8801446   .0104174    84.49   0.000     .8597268    .9005624
          m7 |   .1492271   .0060785    24.55   0.000     .1373135    .1611408
          m8 |   .1311644    .006022    21.78   0.000     .1193613    .1429674
          m9 |    -.30204    .005887   -51.31   0.000    -.3135784   -.2905016
       _cons |  -3.099777   .0188932  -164.07   0.000    -3.136807   -3.062747
-------------+----------------------------------------------------------------
      rho_ar |  .41867109
     sigma_u |  .91598945
     sigma_e |  .53018169
     rho_fov |  .74905341   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1895,156950) =    97.15         Prob > F = 0.0000
```

- FLR Customers

```
FE (within) regression with AR(1) disturbances  Number of obs      =     66128
Group variable: billaccountnum                  Number of groups   =       791

R-sq:  within  = 0.2073                         Obs per group: min =        82
       between = 0.0016                                        avg =      83.6
       overall = 0.1069                                        max =        84

                                                F(17,65320)        =   1004.82
corr(u_i, Xb)  = -0.0001                        Prob > F           =    0.0000

------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |   .0600998    .009818     6.12   0.000     .0408564    .0793431
      event7 |  -.1908444   .0198532    -9.61   0.000    -.2297567   -.1519321
    peak_thi |    .029904   .0263238     1.14   0.256    -.0216905    .0814986
 prepeak_thi |  -.0703342   .0278939    -2.52   0.012    -.1250062   -.0156622
    morn_thi |  -.0733053   .0163766    -4.48   0.000    -.1054036   -.0412071
    lag1_thi |   .0306897    .012787     2.40   0.016     .0056271    .0557523
   peak_thi2 |  -.0001706   .0001782    -0.96   0.338      -.00052    .0001787
prepeak_thi2 |   .0006889   .0001916     3.60   0.000     .0003135    .0010644
   morn_thi2 |   .0006249   .0001256     4.97   0.000     .0003787    .0008711
   lag1_thi2 |  -.0000788   .0000942    -0.84   0.403    -.0002635    .0001059
         dt2 |    -.07439   .0104826    -7.10   0.000    -.0949359   -.0538441
         dt3 |  -.1078658    .015157    -7.12   0.000    -.1375735   -.0781582
         dt4 |   -.131861   .0173104    -7.62   0.000    -.1657894   -.0979326
         dt5 |  -.1164779   .0181444    -6.42   0.000    -.1520409   -.0809149
          m7 |   .1014141   .0090581    11.20   0.000     .0836603    .1191679
          m8 |   .0262965   .0090421     2.91   0.004     .0085741     .044019
          m9 |  -.0834442   .0095327    -8.75   0.000    -.1021283   -.0647601
       _cons |   .2649714   .0351043     7.55   0.000      .196167    .3337759
-------------+----------------------------------------------------------------
      rho_ar |  .40835675
     sigma_u |  .88166771
     sigma_e |  .51260949
     rho_fov |  .74736385   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(790,65320) =   103.79           Prob > F = 0.0000
```

Table 5-4 Comparison of Event-Day Load Impact Estimates for Alternative Specifications, CPP Customers[68]

Table 5-4 contains a subset of the results from the five models detailed below where each is a linear fixed-effects model with first-order autoregressive disturbances. The models contain one observation per non-holiday weekday for each customer within the CPP rate treatment group. The dependent variable in each model is ln_kwh as defined above.

- Original model (using THI to identify weather conditions)

```
FE (within) regression with AR(1) disturbances  Number of obs      =    158859
Group variable: billaccountnum                  Number of groups   =      1896

R-sq:  within  = 0.1842                         Obs per group: min =        20
       between = 0.0005                                        avg =      83.8
       overall = 0.0934                                        max =        85

                                                F(17,156946)       =   2084.41
corr(u_i, Xb)  = 0.0004                         Prob > F           =    0.0000

------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |   .0020267   .0063444     0.32   0.749    -.0104083    .0144617
      event7 |   -.174486   .0129841   -13.44   0.000    -.1999346   -.1490374
    peak_thi |  -.0385069   .0171097    -2.25   0.024    -.0720417   -.0049722
 prepeak_thi |   .0133224   .0182935     0.73   0.466    -.0225324    .0491772
    morn_thi |  -.0561192   .0107302    -5.23   0.000    -.0771501   -.0350883
    lag1_thi |   .0066078    .008421     0.78   0.433    -.0098972    .0231128
   peak_thi2 |   .0003228   .0001156     2.79   0.005     .0000962    .0005493
prepeak_thi2 |    .000067   .0001254     0.53   0.593    -.0001789    .0003129
   morn_thi2 |    .000488   .0000822     5.94   0.000     .0003268    .0006492
   lag1_thi2 |   .0000911    .000062     1.47   0.142    -.0000304    .0002127
         dt2 |  -.0509658   .0084306    -6.05   0.000    -.0674897   -.0344419
         dt3 |  -.0623147   .0127519    -4.89   0.000    -.0873082   -.0373212
         dt4 |  -.0806355   .0144515    -5.58   0.000    -.1089601   -.0523108
         dt5 |  -.0618504   .0152661    -4.05   0.000    -.0917717   -.0319292
          m7 |   .0887077   .0060148    14.75   0.000     .0769189    .1004965
          m8 |   .0363456   .0060086     6.05   0.000     .0245689    .0481223
          m9 |  -.1078873   .0063998   -16.86   0.000    -.1204307   -.0953439
       _cons |   .1167693   .0290589     4.02   0.000     .0598144    .1737241
-------------+----------------------------------------------------------------
      rho_ar |  .41718594
     sigma_u |  .91557033
```

[68] Table 5-4 can be found on page 5-18 of EPRI 1023644.

```
     sigma_e |  .51798515
     rho_fov |  .75753295   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1895,156946) =   105.77         Prob > F = 0.0000
```

- Model using CDH to identify weather conditions

```
FE (within) regression with AR(1) disturbances  Number of obs      =    158859
Group variable: billaccountnum                  Number of groups   =      1896

R-sq:  within  = 0.1783                         Obs per group: min =        20
       between = 0.0002                                        avg =      83.8
       overall = 0.0846                                        max =        85

                                                F(17,156946)       =   2003.79
corr(u_i, Xb)  = 0.0000                         Prob > F           =    0.0000

------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |  -.0509619   .0066364    -7.68   0.000     -.063969   -.0379547
      event7 |  -.1669529   .0132271   -12.62   0.000    -.1928778    -.141028
  peak_cdh65 |  -.0024944   .0017197    -1.45   0.147     -.005865    .0008761
prepeak_c~65 |   .0040432   .0019386     2.09   0.037     .0002437    .0078428
  morn_cdh65 |   .0251755   .0015229    16.53   0.000     .0221906    .0281604
  lag1_cdh65 |   .0184143   .0011602    15.87   0.000     .0161404    .0206882
 peak_cdh652 |   .0005429   .0000573     9.48   0.000     .0004306    .0006551
prepeak_~652 |   .0001952   .0000718     2.72   0.007     .0000545    .0003359
 morn_cdh652 |  -.0006792    .000103    -6.59   0.000     -.000881   -.0004773
 lag1_cdh652 |  -.0002889   .0000641    -4.51   0.000    -.0004145   -.0001633
         dt2 |   .1270399   .0044466    28.57   0.000     .1183247    .1357551
         dt3 |   .2187099   .0054892    39.84   0.000     .2079512    .2294686
         dt4 |   .2363762   .0059667    39.62   0.000     .2246815    .2480708
         dt5 |   .2399379    .006185    38.79   0.000     .2278154    .2520603
          m7 |   .0161819   .0062434     2.59   0.010     .0039451    .0284188
          m8 |   .0041893   .0062276     0.67   0.501    -.0080167    .0163953
          m9 |  -.2189308   .0061024   -35.88   0.000    -.2308913   -.2069702
       _cons |   -1.00976   .0061963  -162.96   0.000    -1.021904   -.9976151
-------------+----------------------------------------------------------------
      rho_ar |  .41826421
     sigma_u |  .91573304
     sigma_e |   .5196999
     rho_fov |  .75638229   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1895,156946) =   104.39         Prob > F = 0.0000
```

- Model using THI to identify weather conditions and omitting quadratic weather terms

```
FE (within) regression with AR(1) disturbances  Number of obs      =    158859
Group variable: billaccountnum                  Number of groups   =      1896

R-sq:  within  = 0.1447                         Obs per group: min =        20
       between = 0.0001                                        avg =      83.8
       overall = 0.0386                                        max =        85

                                                F(13,156950)       =   2041.93
corr(u_i, Xb)  = -0.0004                        Prob > F           =    0.0000

------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |   .0753873   .0055314    13.63   0.000     .0645458    .0862288
      event7 |  -.0108171   .0130534    -0.83   0.407    -.0364015    .0147672
    peak_thi |  -.0021315   .0009417    -2.26   0.024    -.0039773   -.0002857
 prepeak_thi |   .0167918   .0010575    15.88   0.000     .0147191    .0188644
    morn_thi |   .0113215   .0006803    16.64   0.000     .0099881     .012655
    lag1_thi |   .0002445   .0004957     0.49   0.622     -.000727     .001216
         dt2 |   .4409316   .0062823    70.19   0.000     .4286183    .4532449
         dt3 |   .7397713   .0087414    84.63   0.000     .7226383    .7569043
         dt4 |   .8196106   .0099937    82.01   0.000     .8000232     .839198
         dt5 |   .8801446   .0104174    84.49   0.000     .8597268    .9005624
          m7 |   .1492271   .0060785    24.55   0.000     .1373135    .1611408
          m8 |   .1311644    .006022    21.78   0.000     .1193613    .1429674
          m9 |    -.30204    .005887   -51.31   0.000    -.3135784   -.2905016
       _cons |  -3.099777   .0188932  -164.07   0.000    -3.136807   -3.062747
-------------+----------------------------------------------------------------
      rho_ar |  .41867109
     sigma_u |  .91598945
     sigma_e |  .53018169
     rho_fov |  .74905341   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1895,156950) =    97.15         Prob > F = 0.0000
```

- Model using CDH to identify weather conditions and omitting quadratic weather terms

```
FE (within) regression with AR(1) disturbances  Number of obs      =    158859
Group variable: billaccountnum                  Number of groups   =      1896

R-sq:  within  = 0.1766                         Obs per group: min =        20
       between = 0.0002                                        avg =      83.8
```

```
       overall = 0.0834                                         max =         85

                                                F(13,156950)       =   2589.71
corr(u_i, Xb)  = 0.0000                         Prob > F           =    0.0000

------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |   .0190214   .0054273     3.50   0.000      .008384    .0296588
      event7 |  -.1662718   .0130745   -12.72   0.000    -.1918975   -.1406462
  peak_cdh65 |   .0089463   .0005534    16.16   0.000     .0078616    .0100311
prepeak_c~65 |   .0092719   .0006616    14.02   0.000     .0079753    .0105686
  morn_cdh65 |   .0195919   .0006979    28.07   0.000      .018224    .0209599
  lag1_cdh65 |   .0132438   .0004786    27.67   0.000     .0123059    .0141818
         dt2 |   .1318148   .0043893    30.03   0.000     .1232118    .1404177
         dt3 |   .2277859   .0053561    42.53   0.000      .217288    .2382837
         dt4 |   .2566652   .0057011    45.02   0.000     .2454913    .2678392
         dt5 |   .2674597   .0057958    46.15   0.000     .2561001    .2788192
          m7 |   .0222312   .0062158     3.58   0.000     .0100483     .034414
          m8 |   .0067249   .0061252     1.10   0.272    -.0052805    .0187302
          m9 |   -.224131   .0058843   -38.09   0.000     -.235664    -.212598
       _cons |  -1.069773   .0051724  -206.82   0.000     -1.07991   -1.059635
-------------+----------------------------------------------------------------
      rho_ar |  .41705651
     sigma_u |  .91573482
     sigma_e |  .52039434
     rho_fov |  .75589055   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1895,156950) =   104.46         Prob > F = 0.0000
```

- Model using THI to identify weather conditions, omitting quadratic weather terms, and only including data for days in September

```
FE (within) regression with AR(1) disturbances  Number of obs      =     37523
Group variable: billaccountnum                  Number of groups   =      1885

R-sq:  within  = 0.0725                         Obs per group: min =         4
       between = 0.0007                                        avg =      19.9
       overall = 0.0090                                        max =        20

                                                F(9,35629)         =    309.30
corr(u_i, Xb)  = -0.0005                        Prob > F           =    0.0000

------------------------------------------------------------------------------
      ln_kwh |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
event_day_~d |   .2116163   .0129614    16.33   0.000     .1862115    .2370211
      event7 |  (omitted)
```

```
   peak_thi |   .0318561   .0022283    14.30   0.000     .0274886    .0362236
prepeak_thi |  -.0183367   .0023701    -7.74   0.000    -.0229821   -.0136912
   morn_thi |  -.0108118   .0010196   -10.60   0.000    -.0128102   -.0088135
   lag1_thi |   .0137351    .000882    15.57   0.000     .0120064    .0154637
        dt2 |   .1797122   .0092141    19.50   0.000     .1616522    .1977722
        dt3 |   .2600818   .0113207    22.97   0.000     .2378929    .2822707
        dt4 |   .4397042   .0101413    43.36   0.000      .419827    .4595814
        dt5 |   .3122569   .0119659    26.10   0.000     .2888033    .3357105
         m7 |  (omitted)
         m8 |  (omitted)
         m9 |  (omitted)
      _cons |  -2.323566   .0385274   -60.31   0.000    -2.399081   -2.248051
-------------+----------------------------------------------------------------
     rho_ar |  .18226487
    sigma_u |  .82601778
    sigma_e |  .43658513
    rho_fov |  .78164284   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1884,35629) =    50.68          Prob > F = 0.0000
```

Table 5-7 NCES Estimated Elasticities of Substitution, by Rate[69]

Table 5-7 contains a subset of the results from the Stata output tables provided below. The model and the variables used within it are defined in Appendix D of this addendum. For reference, the NCES model is estimated using a linear regression including one observation per subperiod per non-holiday weekday between June 1, 2010 and August 31, 2010. In order to relate the terms from the Stata output below to Appendix D and the Phase 2 report, the following variable definitions are needed:

- energyterm
  The dependent variable is equal to the left-hand side variable in equation (1) of Appendix D
- term2
  corresponds to the first right-hand side variable in equation (1) of Appendix D
- term3
  corresponds to the second right-hand side variable in equation (1) of Appendix D
- weatherterm
  corresponds to the weather variable defined on page 4 of Appendix D

[69] Table 5-7 can be found on page 5-30 of EPRI 1023644.

- subperiod_2
  is an indicator variable that equals one for morning shoulder observations and zero otherwise, where morning shoulder is defined in Appendix D
- subperiod_3
  is an indicator variable that equals one for peak observations and zero otherwise, where peak is defined in Appendix D
- subperiod_2
  is an indicator variable that equals one for evening shoulder observations and zero otherwise, where evening shoulder is defined in Appendix D
- month7
  is an indicator variable that equals one during the month of July and zero otherwise
- month8
  is an indicator variable that equals one during the month of August and zero otherwise
- _cons
  corresponds to a constant term

The "Within-Day" results presented in Table 5-7 correspond to term2 and the "Between-Day" results presented in Table 5-7 correspond to term3.

- CPP Responders

```
      Source |       SS       df       MS              Number of obs =     256
-------------+------------------------------           F(  8,    247) =  272.82
       Model |  25.7724629     8  3.22155786           Prob > F      =  0.0000
    Residual |  2.91667821   247  .011808414           R-squared     =  0.8983
-------------+------------------------------           Adj R-squared =  0.8950
       Total |  28.6891411   255  .112506436           Root MSE      =  .10867
------------------------------------------------------------------------------
  energyterm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       term2 |   .0946973   .0173433     5.46   0.000     .0605377    .1288569
       term3 |   .1493888   .0171635     8.70   0.000     .1155833    .1831943
 weatherterm |   5.183334   .1510762    34.31   0.000     4.885772    5.480896
             |
 subperiod_n |
          2  |  -.3502388   .0216802   -16.15   0.000    -.3929404   -.3075372
          3  |  -.2813985   .0242353   -11.61   0.000    -.3291328   -.2336642
          4  |   .1258562    .020612     6.11   0.000     .0852585    .1664539
             |
       month |
          7  |  -.0261986   .0213453    -1.23   0.221    -.0682406    .0158434
          8  |  -.1189411   .0198809    -5.98   0.000    -.1580988   -.0797835
             |
       _cons |   .0765955   .0171594     4.46   0.000     .0427982    .1103929
------------------------------------------------------------------------------
```

- PTR Responders

```
      Source |       SS       df       MS              Number of obs =     256
-------------+------------------------------           F(  8,   247) =  244.85
       Model |  20.2968275     8  2.53710344           Prob > F      =  0.0000
    Residual |  2.55940856   247  .010361978           R-squared     =  0.8880
-------------+------------------------------           Adj R-squared =  0.8844
       Total |  22.8562361   255  .089632298           Root MSE      =  .10179

------------------------------------------------------------------------------
  energyterm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       term2 |   .0656668   .0171114     3.84   0.000      .031964    .0993697
       term3 |   .1238349    .017155     7.22   0.000     .0900461    .1576236
 weatherterm |   4.574209   .1414808    32.33   0.000     4.295547    4.852872
             |
 subperiod_n |
          2  |  -.2695499   .0202965   -13.28   0.000    -.3095262   -.2295737
          3  |  -.2002193   .0226267    -8.85   0.000    -.2447852   -.1556535
          4  |   .1261772   .0192854     6.54   0.000     .0881923     .164162
             |
       month |
          7  |  -.0053383   .0196359    -0.27   0.786    -.0440134    .0333369
          8  |  -.0615904   .0184429    -3.34   0.001    -.0979158    -.025265
             |
       _cons |     .05817   .0160316     3.63   0.000     .0265939    .0897461
------------------------------------------------------------------------------
```

Table 5-8 GL Estimated Elasticity of Substitution for Event-responders, by Rate and Day Type[70]

The output tables below contain results of Generalized Leontief models when estimated using data for customers identified as responders, aggregated by rate type (CPP and PTR only). Each model is a non-liner regression specified according to the equation in Chapter 5 of the Phase 1 report.[71] Appendix A of the Phase 1 report outlines the methdology used and defines the variable labels found in the tables below.[72]

[70] Table 5-8 can be found on page 5-32 of EPRI 1023644.

[71] *The Effect on Electricity Consumption of the Commonwealth Edison Customer Application Program Pilot: Phase 1*. EPRI, Palo Alto, CA: 2011. 1022703.

[72] *The Effect on Electricity Consumption of the Commonwealth Edison Customer Application Program Pilot: Phase 1, Appendices*. EPRI, Palo Alto, CA: 2011. 1022761.

- CPP reponders

```
      Source |       SS       df       MS
-------------+------------------------------           Number of obs =        65
       Model |   93.435025     4  23.3587563           R-squared     =    0.9958
    Residual |  .390497425    61  .006401597           Adj R-squared =    0.9956
-------------+------------------------------           Root MSE      =    .08001
       Total |  93.8255225    65  1.44346958           Res. dev.     = -147.9949

------------------------------------------------------------------------------
ln_es_p_es_o |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         /cd |   .0078396   .0034478     2.27   0.027     .0009453     .014734
         /hp |   .0008174   .0007201     1.14   0.261    -.0006224    .0022573
        /gpp |   .1303744   .0071107    18.34   0.000     .1161558    .1445931
        /gpo |   .0333374    .005565     5.99   0.000     .0222096    .0444653
------------------------------------------------------------------------------

------------------------------------------------------------------------------
ln_es_p_es_o |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         goo |   .8029507   .0059416   135.14   0.000     .7910697    .8148317
------------------------------------------------------------------------------
```

- PTR reponders

```
      Source |       SS       df       MS
-------------+------------------------------           Number of obs =        65
       Model |  96.3044961     4   24.076124           R-squared     =    0.9968
    Residual |  .308625414    61  .005059433           Adj R-squared =    0.9966
-------------+------------------------------           Root MSE      =  .0711297
       Total |  96.6131215    65  1.48635572           Res. dev.     = -163.2889

------------------------------------------------------------------------------
ln_es_p_es_o |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         /cd |   .0010117   .0030458     0.33   0.741    -.0050787    .0071021
         /hp |   .0010291   .0008164     1.26   0.212    -.0006033    .0026615
        /gpp |   .1569024   .0071624    21.91   0.000     .1425803    .1712246
        /gpo |   .0178729   .0055728     3.21   0.002     .0067294    .0290163
------------------------------------------------------------------------------

------------------------------------------------------------------------------
ln_es_p_es_o |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         goo |   .8073519   .0056849   142.02   0.000     .7959842    .8187195
------------------------------------------------------------------------------
```

Table 5-9 Dependence of the Natural Log of Monthly Usage on IBR Status[73]

Table 5-9 contains results of a linear regression model in which the dependent variable is the natural log of kW usage during a specific billing month averaged across customers in the IBR treatment cells (`ln_avg_usage`). There are two observations for each of 11 available CAP billing months; one observation for the bill month during the CAP period, and a second observation for the same bill month but during the previous year. Here, the independent variable `ibr` equals one during the CAP pilot period and zero otherwise.

```
      Source |       SS       df       MS              Number of obs =      22
-------------+------------------------------           F(  3,    18) =   42.10
       Model |  .838860018     3  .279620006           Prob > F      =  0.0000
    Residual |  .119548701    18  .006641595           R-squared     =  0.8753
-------------+------------------------------           Adj R-squared =  0.8545
       Total |  .958408719    21   .04563851           Root MSE      =   .0815

------------------------------------------------------------------------------
ln_avg_usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     avg_cdd |   .0733018   .0068098    10.76   0.000      .058995    .0876086
     avg_hdd |   .0110992   .0015225     7.29   0.000     .0079006    .0142977
         ibr |  -.0400865   .0375753    -1.07   0.300    -.1190292    .0388563
       _cons |   6.115644   .0432707   141.33   0.000     6.024735    6.206552
------------------------------------------------------------------------------
```

Appendix A Tables

Table A-1 Impacts of Rate Type on Opt Outs

Table A-1 contains the results of a logistic regression using robust standard errors where the dependent variable is a binary choice variable that equals one if the customer opted out of the pilot program and zero otherwise. There is one observation per customer and customers are excluded from the analysis if they are in treatment cells F1 or F2 or if they finaled (e.g., moved out of the residence) before or during the pilot program. Because all customers who opted out of the program received full education, a coefficient could not be estimated for the `full_educ` variable and basic education customers (i.e. those in cell F3) were not included in the regression. The control group consists of customers with the IBR rate treatment and eWeb technology (i.e., treatment cell E1) residing in single-family homes with non-space heating.

[73] Table 5-9 can be found on page 5-33 of EPRI 1023644.

```
Logistic regression                               Number of obs   =       6434
                                                  Wald chi2(13)   =      46.48
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -744.01314                 Pseudo R2       =     0.0439

------------------------------------------------------------------------------
             |               Robust
      optout |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   2.336898   .5943135     3.93   0.000     1.172065    3.501731
         dap |   1.532399   .6235588     2.46   0.014     .3102461    2.754552
         flr |  -.3176118   .9155059    -0.35   0.729     -2.11197    1.476747
         ptr |   1.860378   .6107129     3.05   0.002     .6634022    3.057353
         tou |    1.71322   .6201748     2.76   0.006     .4976998    2.928741
        bihd |   .4857718   .2329289     2.09   0.037     .0292395    .9423041
        aihd |   .0980635   .2683083     0.37   0.715     -.427811     .623938
         pct |   .0955722   .3041559     0.31   0.753    -.5005624    .6917067
   bill_prot |    .293339   .3644349     0.80   0.421    -.4209403    1.007618
  purch_tech |   .1166149   .3847014     0.30   0.762    -.6373861    .8706159
   full_educ |  (omitted)
        SFSH |   .4474348   1.006035     0.44   0.656    -1.524357    2.419227
        MFNS |  -.3598008   .1850959    -1.94   0.052    -.7225821    .0029805
        MFSH |   .4709061   .4373913     1.08   0.282    -.3863651    1.328177
       _cons |  -5.578479   .6114792    -9.12   0.000    -6.776956   -4.380001
------------------------------------------------------------------------------
```

Table A-2 Impacts of Rate Type on Electricity Usage

Table A-2 contains results from two linear regression models using robust standard errors where the dependent variable is `usage`. There is one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Summer

```
Linear regression                                      Number of obs =    5778
                                                       F( 13,  5764) =  140.50
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1908
                                                       Root MSE      =  .67715

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0438367   .0332756     1.32   0.188    -.0213959    .1090693
         dap |   .0631761   .0360335     1.75   0.080    -.0074631    .1338153
```

ptr	.0605055	.0369629	1.64	0.102	-.0119556	.1329666
tou	.0687044	.0372524	1.84	0.065	-.0043243	.1417331
bihd	-.0067263	.0242201	-0.28	0.781	-.0542069	.0407542
aihd	.036752	.0274435	1.34	0.181	-.0170476	.0905516
pct	.0143969	.0346126	0.42	0.677	-.0534568	.0822506
bill_prot	.0242882	.0412734	0.59	0.556	-.0566233	.1051996
purch_tech	-.0550892	.0435824	-1.26	0.206	-.1405271	.0303487
full_educ	-.0768751	.0569643	-1.35	0.177	-.1885465	.0347964
SFSH	.0608919	.1635426	0.37	0.710	-.2597131	.3814968
MFNS	-.681744	.0163047	-41.81	0.000	-.7137075	-.6497806
MFSH	-.6947426	.0381425	-18.21	0.000	-.7695162	-.6199689
_cons	1.376989	.0471172	29.22	0.000	1.284622	1.469357

- Non-Summer

```
Linear regression                                      Number of obs =    5471
                                                       F( 13,  5457) =  105.92
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1728
                                                       Root MSE      =  .51384
```

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0367876	.0274151	1.34	0.180	-.016957	.0905322
dap	.023554	.0295083	0.80	0.425	-.034294	.0814021
ptr	.0349458	.0289368	1.21	0.227	-.0217818	.0916734
tou	.0248327	.0303454	0.82	0.413	-.0346565	.0843218
bihd	.0033768	.0190667	0.18	0.859	-.0340016	.0407552
aihd	.0141961	.021163	0.67	0.502	-.0272918	.055684
pct	-.0158206	.0261871	-0.60	0.546	-.0671577	.0355165
bill_prot	.0425891	.0365079	1.17	0.243	-.028981	.1141591
purch_tech	-.0475397	.0329965	-1.44	0.150	-.112226	.0171466
full_educ	-.0461952	.0446643	-1.03	0.301	-.1337549	.0413646
SFSH	1.398966	.410241	3.41	0.001	.5947298	2.203202
MFNS	-.4407038	.0126199	-34.92	0.000	-.4654438	-.4159639
MFSH	.4930687	.0709546	6.95	0.000	.3539694	.632168
_cons	.9339743	.0355045	26.31	0.000	.8643714	1.003577

Table A-3 Impacts of Rate Type on Summer Peak Load

Table A-3 contains results from the three models detailed below. Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 13,  5764) =  149.93
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1949
                                                       Root MSE      =  .85259

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |    .058554   .0410716     1.43   0.154    -.0219617    .1390697
         dap |   .1008382   .0451884     2.23   0.026     .0122519    .1894245
         ptr |    .082068   .0462535     1.77   0.076    -.0086063    .1727422
         tou |   .0627371   .0459909     1.36   0.173    -.0274223    .1528965
        bihd |   .0047288   .0305293     0.15   0.877    -.0551201    .0645777
        aihd |   .0592565   .0347762     1.70   0.088    -.0089179    .1274309
         pct |   .0006117   .0413959     0.01   0.988    -.0805397    .0817632
   bill_prot |   .0408943   .0518402     0.79   0.430    -.0607318    .1425205
  purch_tech |  -.0560664   .0552798    -1.01   0.311    -.1644356    .0523028
   full_educ |  -.1074225   .0707728    -1.52   0.129    -.2461637    .0313188
        SFSH |   .0831851   .2141098     0.39   0.698    -.3365506    .5029207
        MFNS |  -.8704187   .0200549   -43.40   0.000     -.909734   -.8311035
        MFSH |  -.8460358    .046673   -18.13   0.000    -.9375325   -.7545391
       _cons |   1.563471     .05892    26.54   0.000     1.447966    1.678977
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 13,  5764) =  153.32
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1988
                                                       Root MSE      =  1.1927
------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

cpp	.0017062	.0577115	0.03	0.976	-.11143	.1148423
dap	.1015057	.063502	1.60	0.110	-.0229822	.2259935
ptr	.0804983	.0644706	1.25	0.212	-.0458884	.2068849
tou	.0709674	.0651602	1.09	0.276	-.056771	.1987057
bihd	.0164468	.0423197	0.39	0.698	-.0665158	.0994093
aihd	.0866684	.0483536	1.79	0.073	-.0081228	.1814597
pct	.0115838	.0580159	0.20	0.842	-.1021492	.1253167
bill_prot	.0769908	.0731636	1.05	0.293	-.0664374	.220419
purch_tech	-.0809135	.0757414	-1.07	0.285	-.2293951	.0675681
full_educ	-.2226392	.1058271	-2.10	0.035	-.4301001	-.0151784
SFSH	-.0862252	.2644919	-0.33	0.744	-.6047287	.4322783
MFNS	-1.232025	.028009	-43.99	0.000	-1.286933	-1.177116
MFSH	-1.202139	.0676078	-17.78	0.000	-1.334676	-1.069603
_cons	2.231532	.0911892	24.47	0.000	2.052767	2.410297

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 13,  5457) =   97.23
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1615
                                                       Root MSE      =   .5026
```

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0536889	.0263949	2.03	0.042	.0019443	.1054336
dap	.0356171	.0283384	1.26	0.209	-.0199375	.0911717
ptr	.0503471	.0277763	1.81	0.070	-.0041056	.1047998
tou	.017267	.0290992	0.59	0.553	-.0397789	.074313
bihd	.0046209	.0187697	0.25	0.806	-.0321752	.041417
aihd	.015775	.0210328	0.75	0.453	-.0254576	.0570077
pct	-.0252307	.0251335	-1.00	0.315	-.0745023	.024041
bill_prot	.0403582	.0363083	1.11	0.266	-.0308207	.111537
purch_tech	-.0426725	.032639	-1.31	0.191	-.106658	.021313
full_educ	-.0311113	.0432479	-0.72	0.472	-.1158945	.0536719
SFSH	1.38005	.4014583	3.44	0.001	.5930319	2.167068
MFNS	-.4140417	.0123408	-33.55	0.000	-.4382347	-.3898487
MFSH	.4346936	.0726003	5.99	0.000	.292368	.5770192
_cons	.8446697	.0344656	24.51	0.000	.7771034	.912236

Table A-4 Impacts of Rate Type on Peak to Off-Peak Load Ratios

Table A-4 contains results from two linear regression models using robust standard errors where the dependent variable is `peak_offpeak`. There is one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Summer

Linear regression

Number of obs	5778
F(13, 5764)	31.05
Prob > F	0.0000
R-squared	0.0628
Root MSE	.28899

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0025945	.0139017	0.19	0.852	-.0246581	.0298472
dap	.0366941	.0155951	2.35	0.019	.0061218	.0672664
ptr	.0067823	.0149893	0.45	0.651	-.0226024	.036167
tou	-.0161976	.0153766	-1.05	0.292	-.0463416	.0139464
bihd	.0121792	.0106368	1.15	0.252	-.0086728	.0330313
aihd	.0186114	.0116592	1.60	0.110	-.0042451	.0414678
pct	.0030235	.0145582	0.21	0.835	-.025516	.0315629
bill_prot	.0301295	.0178623	1.69	0.092	-.0048873	.0651462
purch_tech	.0010502	.0183482	0.06	0.954	-.0349191	.0370195
full_educ	-.0094741	.0260671	-0.36	0.716	-.0605754	.0416272
SFSH	.0324893	.06946	0.47	0.640	-.1036785	.1686571
MFNS	-.1526917	.0079561	-19.19	0.000	-.1682886	-.1370947
MFSH	-.0580946	.035337	-1.64	0.100	-.1273684	.0111792
_cons	1.118611	.0223369	50.08	0.000	1.074822	1.162399

- Non-Summer

Linear regression

Number of obs	5471
F(13, 5457)	3.01
Prob > F	0.0002
R-squared	0.0067
Root MSE	.20416

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]

cpp	.0156775	.0113494	1.38	0.167	-.006572	.0379269
dap	.0167572	.0119674	1.40	0.161	-.0067036	.0402179
ptr	.0224681	.011855	1.90	0.058	-.0007724	.0457087
tou	-.0183263	.0122963	-1.49	0.136	-.0424319	.0057793
bihd	.0059352	.0078276	0.76	0.448	-.0094101	.0212804
aihd	.0101619	.0086948	1.17	0.243	-.0068835	.0272072
pct	-.0000368	.0107367	-0.00	0.997	-.0210851	.0210115
bill_prot	.0049731	.012595	0.39	0.693	-.0197181	.0296643
purch_tech	-.0059502	.0130724	-0.46	0.649	-.0315773	.019677
full_educ	.0223814	.0184685	1.21	0.226	-.0138243	.0585871
SFSH	.0530838	.0425152	1.25	0.212	-.030263	.1364305
MFNS	-.0006674	.0067494	-0.10	0.921	-.0138988	.0125641
MFSH	-.0142835	.0247994	-0.58	0.565	-.0629001	.0343332
_cons	.9040381	.0150896	59.91	0.000	.8744565	.9336197

Table A-5 Impacts of Rate Type on Customer Satisfaction

Table A-5 contains results from a linear regression model using robust standard errors where the dependent variable is `satisfaction`. There is one observation per customer; and customers are excluded if they did not answer questions 22 and 23 on the CAP final survey. The control group consists of customers with the IBR rate treatment and eWeb technology (i.e., treatment cell E1) residing in single-family homes with non-space heating.

```
Linear regression                                      Number of obs =    2371
                                                       F( 14,  2356) =    1.54
                                                       Prob > F      =  0.0903
                                                       R-squared     =  0.0088
                                                       Root MSE      =  2.3914
```

satisfaction	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
flr	-.2938424	.2107173	-1.39	0.163	-.7070529	.1193682
cpp	-.2479795	.1936076	-1.28	0.200	-.6276385	.1316795
dap	-.0107282	.20205	-0.05	0.958	-.4069425	.3854861
ptr	-.0931109	.208267	-0.45	0.655	-.5015165	.3152947
tou	-.1171016	.2183325	-0.54	0.592	-.5452454	.3110421
bihd	.006564	.1355614	0.05	0.961	-.259268	.2723961
aihd	-.0938261	.1482152	-0.63	0.527	-.3844719	.1968197
pct	.1898171	.2193727	0.87	0.387	-.2403665	.6200008
bill_prot	.2083255	.2677845	0.78	0.437	-.3167923	.7334433
purch_tech	-.1071475	.2542969	-0.42	0.674	-.6058165	.3915215
full_educ	.3117088	.2230113	1.40	0.162	-.12561	.7490276
SFSH	-.2355297	.2843085	-0.83	0.408	-.7930506	.3219912

MFNS	.0156165	.1109001	0.14	0.888	-.2018554	.2330884
MFSH	-.3048761	.2437285	-1.25	0.211	-.7828208	.1730686
_cons	5.838803	.2721052	21.46	0.000	5.305213	6.372394

Table A-6 Impacts of Technology on Implementation Rates

Table A-6 contains the results of a logistic regression using robust standard errors where the dependent variable is a binary choice variable that takes on the value of unity if the customer implemented the technology and zero otherwise (implement). There is one observation per customer, and customers are excluded if they are in treatment cell F1 or are in any of the eWeb treatment cells. The control group consists of customers in treatment cells F6 and F7 residing in single-family homes with non-space heating.

```
Logistic regression                               Number of obs   =       5532
                                                  Wald chi2(11)   =     294.39
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -2573.9014                 Pseudo R2       =     0.0760
```

implement	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
cpp	.2933847	.1338142	2.19	0.028	.0311137	.5556558
dap	.1754118	.142286	1.23	0.218	-.1034636	.4542871
ptr	.0203115	.1411823	0.14	0.886	-.2564007	.2970236
tou	.2811411	.141036	1.99	0.046	.0047156	.5575666
ibr	.0652194	.1576403	0.41	0.679	-.2437499	.3741887
aihd	-1.106367	.0865399	-12.78	0.000	-1.275982	-.9367515
pct	-.9201849	.1207297	-7.62	0.000	-1.156811	-.683559
bill_prot	(omitted)					
purch_tech	-2.875939	.3687717	-7.80	0.000	-3.598719	-2.15316
full_educ	(omitted)					
SFSH	-.3778038	.6836568	-0.55	0.581	-1.717747	.962139
MFNS	-.5252873	.0771247	-6.81	0.000	-.6764489	-.3741257
MFSH	-.3810105	.2740869	-1.39	0.164	-.918211	.15619
_cons	-.8535895	.1171407	-7.29	0.000	-1.083181	-.623998

Table A-7 Impacts of Technology on Adoption Rates

Table A-7 contains the results of a logistic regression using robust standard errors where the dependent variable is a binary choice variable that takes on the value of unity if the customer adopted the technology and zero otherwise (adoption). There is one observation per customer; and customers are excluded if they are in treatment cell F1, are in any of the eWeb treatment cells, did not answer the relevant question on the final survey, or did not implement their in-home device. The control group consists of customers in treatment cells F6 and F7 residing in single-family homes with non-space heating.

```
Logistic regression                               Number of obs   =        449
                                                  Wald chi2(11)   =       7.49
                                                  Prob > chi2     =     0.7584
Log pseudolikelihood = -271.54621                 Pseudo R2       =     0.0139

------------------------------------------------------------------------------
             |               Robust
    adoption |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |     .03074   .4035733     0.08   0.939    -.7602491    .8217291
         dap |   .0432421   .4261107     0.10   0.919    -.7919196    .8784038
         ptr |   .2323064   .4333039     0.54   0.592    -.6169537    1.081567
         tou |  -.4770633   .4100095    -1.16   0.245    -1.280667    .3265406
         ibr |   .0349632   .4677758     0.07   0.940    -.8818606     .951787
        aihd |   .2774548   .2672377     1.04   0.299    -.2463215    .8012312
         pct |   .3541956   .4007495     0.88   0.377     -.431259     1.13965
   bill_prot |  (omitted)
  purch_tech |   .3479315   .8983352     0.39   0.699    -1.412773    2.108636
   full_educ |  (omitted)
        SFSH |  -1.060351   1.380261    -0.77   0.442    -3.765613     1.64491
        MFNS |   .1182039   .2489371     0.47   0.635    -.3697038    .6061116
        MFSH |  -.1194852   .7755651    -0.15   0.878    -1.639565    1.400594
       _cons |   .7517302   .3406286     2.21   0.027     .0841103     1.41935
------------------------------------------------------------------------------
```

Table A-8 Impacts of Feedback Solutions on Electricity Usage

Table A-8 contains results for seven models detailed below. These models differ from those in Tables A-2 through A-4 in that they include variables pertaining to feedback solutions used by customers (direct, indirect, direct_ind~t). Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     677
                                                       F( 16,   660) =   17.66
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2252
                                                       Root MSE      =   .6138

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0764919    .083383     0.92   0.359    -.0872361    .2402198
         dap |   .0258092   .0885088     0.29   0.771    -.1479836     .199602
         ptr |   .0154788   .0858043     0.18   0.857    -.1530035    .1839612
         tou |   .0568114    .097085     0.59   0.559    -.1338212     .247444
        bihd |   .0104112   .0828971     0.13   0.900    -.1523625     .173185
        aihd |  -.0067004   .0912509    -0.07   0.941    -.1858776    .1724767
         pct |      .0324   .1010644     0.32   0.749    -.1660464    .2308464
   bill_prot |   .2267001    .167049     1.36   0.175    -.1013114    .5547117
  purch_tech |  -.1003051   .1480244    -0.68   0.498    -.3909606    .1903503
   full_educ |   .0928952   .1615582     0.57   0.565    -.2243348    .4101253
        SFSH |   .2644371   .2379685     1.11   0.267    -.2028294    .7317036
        MFNS |   -.684124   .0432848   -15.81   0.000    -.7691166   -.5991314
        MFSH |  -.7222345   .1112461    -6.49   0.000    -.9406734   -.5037956
      direct |  -.0437082   .0527974    -0.83   0.408    -.1473794     .059963
    indirect |  -.1719632   .2694851    -0.64   0.524    -.7011147    .3571883
direct_ind~t |   .3160132   .2997882     1.05   0.292    -.2726403    .9046667
       _cons |   1.225054   .1307769     9.37   0.000     .9682651    1.481843
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     677
                                                       F( 16,   660) =   16.80
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1989
                                                       Root MSE      =   .7897

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |    .094341   .1090174     0.87   0.387    -.1197217    .3084036
         dap |   .0438119   .1135533     0.39   0.700    -.1791574    .2667812
```

ptr	.0425047	.1113672	0.38	0.703	-.1761721	.2611815
tou	.0597674	.1269059	0.47	0.638	-.1894206	.3089553
bihd	.0019525	.0993437	0.02	0.984	-.1931154	.1970203
aihd	-.0192251	.1096261	-0.18	0.861	-.2344831	.1960329
pct	-.0150662	.1243672	-0.12	0.904	-.2592692	.2291369
bill_prot	.1848628	.18731	0.99	0.324	-.1829326	.5526582
purch_tech	-.1514635	.1988469	-0.76	0.447	-.5419123	.2389853
full_educ	.1428199	.2044168	0.70	0.485	-.2585657	.5442056
SFSH	.3169676	.3790415	0.84	0.403	-.4273049	1.06124
MFNS	-.8238864	.0529379	-15.56	0.000	-.9278334	-.7199395
MFSH	-.8090875	.1411227	-5.73	0.000	-1.086191	-.531984
direct	-.0612877	.0693559	-0.88	0.377	-.1974724	.0748971
indirect	-.1649992	.3384686	-0.49	0.626	-.8296043	.4996058
direct_ind~t	.2700381	.3784109	0.71	0.476	-.4729961	1.013072
_cons	1.314857	.1683469	7.81	0.000	.9842966	1.645417

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =     677
                                                       F( 16,   660) =   17.08
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2002
                                                       Root MSE      =  1.1358
```

event_peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	-.0707171	.1683701	-0.42	0.675	-.4013228	.2598886
dap	-.0611772	.1719953	-0.36	0.722	-.3989012	.2765468
ptr	-.0891673	.1702846	-0.52	0.601	-.4235322	.2451976
tou	-.0382292	.1916746	-0.20	0.842	-.4145948	.3381363
bihd	-.0107319	.1471505	-0.07	0.942	-.2996714	.2782075
aihd	-.0348782	.1644104	-0.21	0.832	-.3577086	.2879522
pct	-.0108501	.1832058	-0.06	0.953	-.3705867	.3488864
bill_prot	.1888477	.261916	0.72	0.471	-.3254412	.7031367
purch_tech	-.2045592	.2984527	-0.69	0.493	-.7905905	.3814721
full_educ	.2932593	.3194873	0.92	0.359	-.3340748	.9205935
SFSH	.3319726	.433334	0.77	0.444	-.5189068	1.182852
MFNS	-1.199259	.0758786	-15.80	0.000	-1.348251	-1.050266
MFSH	-1.203702	.186546	-6.45	0.000	-1.569997	-.8374066
direct	-.0883884	.0994269	-0.89	0.374	-.2836195	.1068428
indirect	-.359103	.4659974	-0.77	0.441	-1.274119	.5559131
direct_ind~t	.5145449	.5434325	0.95	0.344	-.55252	1.58161
_cons	1.870405	.2635419	7.10	0.000	1.352923	2.387887

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     677
                                                       F( 16,   660) =    2.05
                                                       Prob > F      =  0.0090
                                                       R-squared     =  0.0443
                                                       Root MSE      =  .26623

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0189511   .0349326     0.54   0.588    -.0496413    .0875435
         dap |   .0337331   .0382187     0.88   0.378    -.0413118    .1087781
         ptr |   .0333727   .0378293     0.88   0.378    -.0409076     .107653
         tou |  -.0247541    .037914    -0.65   0.514    -.0992008    .0496925
        bihd |  -.0395952   .0378513    -1.05   0.296    -.1139187    .0347284
        aihd |  -.0475613   .0400382    -1.19   0.235    -.1261789    .0310562
         pct |  -.0700195   .0447614    -1.56   0.118    -.1579113    .0178724
   bill_prot |  -.0791287   .0531154    -1.49   0.137    -.1834242    .0251668
  purch_tech |   .0111391   .0845114     0.13   0.895    -.1548046    .1770828
   full_educ |    .068624   .0807229     0.85   0.396    -.0898806    .2271285
        SFSH |   .0572623   .1132815     0.51   0.613    -.1651732    .2796979
        MFNS |  -.1033746   .0227557    -4.54   0.000    -.1480568   -.0586924
        MFSH |    .016025   .1070179     0.15   0.881    -.1941116    .2261616
      direct |  -.0342141   .0234044    -1.46   0.144    -.0801702     .011742
    indirect |    .041819   .0889659     0.47   0.638    -.1328713    .2165093
direct_ind~t |  -.0825254   .1028892    -0.80   0.423    -.2845549    .1195042
       _cons |   1.052874   .0688415    15.29   0.000     .9176989    1.188048
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     680
                                                       F( 16,   663) =   11.33
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1777
                                                       Root MSE      =  .49651

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0722733   .0677459     1.07   0.286    -.0607491    .2052956
         dap |  -.0094675   .0724928    -0.13   0.896    -.1518107    .1328757
```

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ptr	.0476659	.0728935	0.65	0.513	-.095464	.1907958
tou	.0886249	.0817235	1.08	0.279	-.0718433	.249093
bihd	-.0455325	.0701763	-0.65	0.517	-.1833271	.0922622
aihd	-.0548451	.0718758	-0.76	0.446	-.1959767	.0862864
pct	-.0108397	.0886528	-0.12	0.903	-.1849137	.1632343
bill_prot	.3288739	.1842972	1.78	0.075	-.0330026	.6907504
purch_tech	-.0717027	.1148324	-0.62	0.533	-.2971816	.1537763
full_educ	.1126689	.1349238	0.84	0.404	-.1522606	.3775984
SFSH	1.016349	.7168663	1.42	0.157	-.3912525	2.423951
MFNS	-.4396754	.0351265	-12.52	0.000	-.5086479	-.3707028
MFSH	.2684252	.1980562	1.36	0.176	-.1204677	.657318
direct	.0295851	.0412871	0.72	0.474	-.051484	.1106543
indirect	.2234316	.3224433	0.69	0.489	-.4097015	.8565647
direct_ind~t	-.1295968	.3370297	-0.38	0.701	-.7913709	.5321773
_cons	.796051	.1053904	7.55	0.000	.5891118	1.00299

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     680
                                                       F( 16,   663) =    9.73
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1617
                                                       Root MSE      =  .48081
```

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.1285637	.0582606	2.21	0.028	.0141662	.2429611
dap	.0402196	.0617414	0.65	0.515	-.0810126	.1614518
ptr	.085212	.0616514	1.38	0.167	-.0358435	.2062676
tou	.1251861	.0732358	1.71	0.088	-.0186159	.2689881
bihd	-.0445985	.0679606	-0.66	0.512	-.1780426	.0888455
aihd	-.0628185	.0690573	-0.91	0.363	-.1984158	.0727788
pct	-.049324	.0830449	-0.59	0.553	-.2123868	.1137388
bill_prot	.3388237	.1829384	1.85	0.064	-.0203847	.6980321
purch_tech	-.0257865	.1227967	-0.21	0.834	-.2669038	.2153307
full_educ	.1270231	.1215587	1.04	0.296	-.1116633	.3657096
SFSH	.9038293	.4869698	1.86	0.064	-.0523595	1.860018
MFNS	-.3906693	.0346021	-11.29	0.000	-.4586122	-.3227264
MFSH	.2447898	.1843514	1.33	0.185	-.1171932	.6067728
direct	.0227948	.0399519	0.57	0.568	-.0556528	.1012424
indirect	.2591233	.3035205	0.85	0.394	-.336854	.8551006
direct_ind~t	-.2127251	.3178904	-0.67	0.504	-.8369183	.411468
_cons	.6668731	.0957317	6.97	0.000	.4788993	.8548469

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     680
                                                       F( 16,   663) =    1.33
                                                       Prob > F      =  0.1699
                                                       R-squared     =  0.0268
                                                       Root MSE      =  .19233

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0583521   .0245904     2.37   0.018     .0100676    .1066367
         dap |   .0552347   .0258561     2.14   0.033     .0044651    .1060043
         ptr |   .0504479   .0249487     2.02   0.044     .0014599    .0994359
         tou |   .0316118   .0259435     1.22   0.223    -.0193295    .0825532
        bihd |   -.012134   .0270489    -0.45   0.654    -.0652459    .0409779
        aihd |  -.0202957   .0281945    -0.72   0.472     -.075657    .0350656
         pct |  -.0324744   .0319651    -1.02   0.310    -.0952394    .0302906
   bill_prot |   .0154208   .0347176     0.44   0.657    -.0527489    .0835905
  purch_tech |    .060878   .0610103     1.00   0.319    -.0589187    .1806748
   full_educ |   .0538779   .0520978     1.03   0.301    -.0484186    .1561744
        SFSH |   .0899603   .1285183     0.70   0.484    -.1623916    .3423121
        MFNS |    .030286   .0183893     1.65   0.100    -.0058222    .0663942
        MFSH |   .0888324   .1284001     0.69   0.489    -.1632874    .3409523
      direct |   .0007089   .0172157     0.04   0.967    -.0330949    .0345127
    indirect |   .0393367   .0456728     0.86   0.389     -.050344    .1290174
direct_ind~t |  -.0791782   .0577605    -1.37   0.171    -.1925937    .0342373
       _cons |   .8291352   .0448616    18.48   0.000     .7410474    .9172231
------------------------------------------------------------------------------
```

Table A-9 Impacts of Technology on Electricity Usage

Table A-9 contains results for seven models detailed below. These models differ from those in Tables A-2 through A-4 in that they include the technology implementation indicator variables defined above (bihd_imp, aihd_imp, pct_imp). Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 16,  5761) =  115.60
                                                       Prob > F      =  0.0000
```

R-squared	= 0.1927
Root MSE	= .67653

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
bihd_imp	.1000672	.0327618	3.05	0.002	.0358419	.1642926
aihd_imp	.0968829	.0507981	1.91	0.057	-.0027006	.1964663
pct_imp	-.0537835	.1880496	-0.29	0.775	-.4224315	.3148644
cpp	.0411228	.0332314	1.24	0.216	-.0240231	.1062688
dap	.0610318	.0359587	1.70	0.090	-.0094607	.1315244
ptr	.0606672	.0368697	1.65	0.100	-.0116112	.1329457
tou	.0654309	.0372559	1.76	0.079	-.0076047	.1384664
bihd	-.0378528	.0262145	-1.44	0.149	-.089243	.0135374
aihd	.0226363	.0280927	0.81	0.420	-.032436	.0777086
pct	.0001903	.0351006	0.01	0.996	-.0686201	.0690007
bill_prot	.0250446	.0412825	0.61	0.544	-.0558846	.1059738
purch_tech	-.0328589	.0441332	-0.74	0.457	-.1193766	.0536589
full_educ	-.0754282	.0569492	-1.32	0.185	-.1870701	.0362137
SFSH	.0644262	.1650838	0.39	0.696	-.2592	.3880524
MFNS	-.67722	.0163665	-41.38	0.000	-.7093045	-.6451355
MFSH	-.6933667	.0382185	-18.14	0.000	-.7682894	-.618444
_cons	1.375561	.0471342	29.18	0.000	1.28316	1.467961

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

Linear regression

Number of obs	= 5778
F(16, 5761)	= 122.40
Prob > F	= 0.0000
R-squared	= 0.1956
Root MSE	= .85244

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
bihd_imp	.0745048	.0422253	1.76	0.078	-.0082726	.1572822
aihd_imp	.0772326	.0673985	1.15	0.252	-.0548937	.2093589
pct_imp	-.0949248	.2317149	-0.41	0.682	-.5491732	.3593236
cpp	.0563917	.0410832	1.37	0.170	-.0241468	.1369303
dap	.0991969	.0451808	2.20	0.028	.0106255	.1877683
ptr	.0823084	.0462002	1.78	0.075	-.0082614	.1728781
tou	.0602777	.0460166	1.31	0.190	-.0299321	.1504875
bihd	-.0184935	.0330493	-0.56	0.576	-.0832826	.0462956
aihd	.0481432	.0354615	1.36	0.175	-.0213747	.1176611
pct	-.009528	.0418519	-0.23	0.820	-.0915734	.0725175
bill_prot	.0415043	.0518582	0.80	0.424	-.0601573	.1431659

```
   purch_tech |  -.0392665   .0559773    -0.70   0.483    -.1490031    .0704701
    full_educ |  -.1062983   .0707795    -1.50   0.133    -.2450528    .0324561
         SFSH |   .0855981   .2155805     0.40   0.691    -.3370207    .5082169
         MFNS |  -.8670921   .0201114   -43.11   0.000    -.9065179   -.8276663
         MFSH |  -.8450249    .046743   -18.08   0.000    -.9366586   -.7533911
        _cons |   1.562421   .0589433    26.51   0.000      1.44687    1.677972
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 16,  5761) =  125.00
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1994
                                                       Root MSE      =  1.1926

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    bihd_imp |   .1105365   .0594144     1.86   0.063    -.0059381    .2270111
    aihd_imp |   .0446753    .089609     0.50   0.618    -.1309921    .2203427
     pct_imp |   -.075664   .2960116    -0.26   0.798    -.6559581    .5046301
         cpp |    .000186     .05773     0.00   0.997    -.1129864    .1133585
         dap |   .0997455   .0634778     1.57   0.116    -.0246948    .2241859
         ptr |   .0806145   .0644309     1.25   0.211    -.0456944    .2069234
         tou |   .0677738   .0651116     1.04   0.298    -.0598695    .1954171
        bihd |  -.0175917   .0457627    -0.38   0.701    -.1073038    .0721203
        aihd |   .0789029   .0493852     1.60   0.110    -.0179106    .1757164
         pct |   .0059616   .0592005     0.10   0.920    -.1100937    .1220168
   bill_prot |   .0774478   .0731854     1.06   0.290     -.066023    .2209186
  purch_tech |  -.0596373   .0764113    -0.78   0.435    -.2094322    .0901576
   full_educ |  -.2216332   .1058445    -2.09   0.036    -.4291282   -.0141382
        SFSH |  -.0820553   .2654641    -0.31   0.757    -.6024648    .4383541
        MFNS |  -1.228191   .0281058   -43.70   0.000    -1.283289   -1.173094
        MFSH |  -1.201975   .0676156   -17.78   0.000    -1.334527   -1.069424
       _cons |   2.230349     .09123    24.45   0.000     2.051504    2.409194
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 16,  5761) =   26.16
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0651
                                                       Root MSE      =  .28872
```

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
bihd_imp	-.0426825	.0134654	-3.17	0.002	-.0690798	-.0162853
aihd_imp	-.0421789	.0177297	-2.38	0.017	-.0769358	-.007422
pct_imp	.0024325	.0741745	0.03	0.974	-.1429773	.1478423
cpp	.0037648	.0139241	0.27	0.787	-.0235316	.0310613
dap	.0376189	.0155728	2.42	0.016	.0070904	.0681474
ptr	.0067539	.0149912	0.45	0.652	-.0226345	.0361422
tou	-.014791	.015367	-0.96	0.336	-.0449161	.0153342
bihd	.0254537	.0116333	2.19	0.029	.0026482	.0482593
aihd	.0247528	.0120068	2.06	0.039	.001215	.0482905
pct	.0096764	.0150558	0.64	0.520	-.0198387	.0391915
bill_prot	.0298073	.0178664	1.67	0.095	-.0052176	.0648322
purch_tech	-.0084841	.0185439	-0.46	0.647	-.0448371	.027869
full_educ	-.0100999	.0260694	-0.39	0.698	-.0612057	.041006
SFSH	.0309144	.0690536	0.45	0.654	-.1044565	.1662853
MFNS	-.1546867	.0079701	-19.41	0.000	-.1703112	-.1390623
MFSH	-.0587449	.0352909	-1.66	0.096	-.1279284	.0104385
_cons	1.119242	.022338	50.10	0.000	1.075451	1.163033

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 16,  5454) =   87.46
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1760
                                                       Root MSE      =  .51297
```

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
bihd_imp	.0834734	.0258096	3.23	0.001	.0328763	.1340706
aihd_imp	.1157489	.0377331	3.07	0.002	.0417769	.1897209
pct_imp	-.0215804	.1194287	-0.18	0.857	-.2557083	.2125475
cpp	.0337275	.027352	1.23	0.218	-.0198933	.0873482
dap	.0212974	.0294407	0.72	0.469	-.0364181	.0790129
ptr	.0355631	.0288199	1.23	0.217	-.0209355	.0920617
tou	.0219061	.030317	0.72	0.470	-.0375274	.0813395
bihd	-.023553	.0204881	-1.15	0.250	-.0637179	.0166118
aihd	-.0026298	.0218524	-0.12	0.904	-.0454692	.0402096
pct	-.0337917	.0261007	-1.29	0.195	-.0849596	.0173761
bill_prot	.0435533	.0365219	1.19	0.233	-.0280443	.1151509

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
purch_tech	-.0263985	.0334345	-0.79	0.430	-.0919434	.0391464
full_educ	-.0448772	.0446413	-1.01	0.315	-.1323919	.0426376
SFSH	1.401196	.4097787	3.42	0.001	.5978667	2.204526
MFNS	-.4360821	.0126518	-34.47	0.000	-.4608847	-.4112794
MFSH	.4957317	.0711734	6.97	0.000	.3562034	.6352599
_cons	.9327224	.0355193	26.26	0.000	.8630903	1.002354

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 16,  5454) =   79.54
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1639
                                                       Root MSE      =  .50201
```

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
bihd_imp	.0646517	.0248794	2.60	0.009	.0158782	.1134252
aihd_imp	.1045673	.0375827	2.78	0.005	.0308902	.1782444
pct_imp	-.0396489	.1056258	-0.38	0.707	-.2467176	.1674197
cpp	.0509237	.0263511	1.93	0.053	-.0007348	.1025823
dap	.0337036	.0282972	1.19	0.234	-.0217703	.0891775
ptr	.0508869	.0276892	1.84	0.066	-.0033949	.1051687
tou	.0149016	.0290985	0.51	0.609	-.042143	.0719462
bihd	-.0163318	.0201486	-0.81	0.418	-.055831	.0231674
aihd	.0008124	.0216976	0.04	0.970	-.0417235	.0433484
pct	-.0409362	.0249997	-1.64	0.102	-.0899457	.0080733
bill_prot	.0412097	.0363231	1.13	0.257	-.0299981	.1124175
purch_tech	-.0255257	.0330879	-0.77	0.440	-.0903913	.0393399
full_educ	-.0299382	.0432369	-0.69	0.489	-.1146998	.0548234
SFSH	1.380982	.4018005	3.44	0.001	.5932923	2.168671
MFNS	-.4102378	.0123463	-33.23	0.000	-.4344416	-.3860341
MFSH	.437008	.0727859	6.00	0.000	.2943186	.5796973
_cons	.8436356	.03448	24.47	0.000	.7760409	.9112302

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 16,  5454) =    2.70
                                                       Prob > F      =  0.0003
                                                       R-squared     =  0.0074
```

```
                                                       Root MSE      =  .20414
------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    bihd_imp |  -.0197577   .0095771    -2.06   0.039    -.0385326   -.0009828
    aihd_imp |   -.008554   .0138082    -0.62   0.536    -.0356237    .0185156
     pct_imp |  -.0007186   .0463796    -0.02   0.988    -.0916412     .090204
         cpp |   .0159078   .0113469     1.40   0.161    -.0063367    .0381522
         dap |   .0170787   .0119561     1.43   0.153      -.00636    .0405174
         ptr |   .0223546   .0118583     1.89   0.059    -.0008923    .0456016
         tou |  -.0177638   .0122786    -1.45   0.148    -.0418348    .0063071
        bihd |   .0121977   .0085864     1.42   0.155     -.004635    .0290304
        aihd |   .0116903   .0089462     1.31   0.191    -.0058478    .0292284
         pct |   .0014125   .0110734     0.13   0.899    -.0202959    .0231208
   bill_prot |    .004872   .0125976     0.39   0.699    -.0198243    .0295682
  purch_tech |  -.0099718   .0131994    -0.76   0.450    -.0358479    .0159043
   full_educ |    .022262   .0184701     1.21   0.228    -.0139467    .0584708
        SFSH |   .0516151   .0420326     1.23   0.220    -.0307855    .1340157
        MFNS |  -.0014225   .0067409    -0.21   0.833    -.0146373    .0117923
        MFSH |  -.0145431   .0247551    -0.59   0.557    -.0630729    .0339866
       _cons |   .9042372   .0150916    59.92   0.000     .8746517    .9338228
------------------------------------------------------------------------------
```

Table A-10 Electricity Usage of Cells Relative to Cell F3

Table A-10 contains the results of seven models detailed below. Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 24,  5753) =   77.60
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1925
                                                       Root MSE      =  .67709
------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0235661   .0557924    -0.42   0.673    -.1329402     .085808
         d1b |   .0353167   .0678275     0.52   0.603    -.0976506    .1682841
          d2 |  -.0567749   .0562499    -1.01   0.313    -.1670459     .053496
          d3 |   .0071579   .0570054     0.13   0.900    -.1045942      .11891
```

```
          d4 |  -.0323614   .0580219    -0.56   0.577    -.1461061    .0813832
          d5 |  -.0210803   .0682537    -0.31   0.757    -.1548833    .1127227
          d6 |  -.0593332   .0572944    -1.04   0.300    -.1716517    .0529853
          d7 |   .0740908   .0763093     0.97   0.332     -.075504    .2236857
          d8 |    .030378   .0632996     0.48   0.631    -.0937131    .1544691
          f5 |  -.0747114   .0715529    -1.04   0.296    -.2149819    .0655592
          f6 |  -.0912611   .0618648    -1.48   0.140    -.2125393    .0300172
          f7 |  -.0322931   .0726032    -0.44   0.656    -.1746228    .1100365
          l1 |  -.0424757   .0656362    -0.65   0.518    -.1711473    .0861959
         l1b |  -.0306671   .0687086    -0.45   0.655    -.1653618    .1040275
          l2 |   .0093276   .0567508     0.16   0.869    -.1019253    .1205806
          l3 |   .0264312   .0664217     0.40   0.691    -.1037803    .1566426
          l4 |   .0020626   .0597872     0.03   0.972    -.1151429    .1192681
          l5 |   .0240391   .0590158     0.41   0.684    -.0916541    .1397324
         l5b |  -.0989448   .0658701    -1.50   0.133     -.228075    .0301854
          l6 |  -.0703873    .067845    -1.04   0.300    -.2033891    .0626144
         l6b |   .0020272   .0707784     0.03   0.977    -.1367251    .1407796
        SFSH |   .0574966   .1655317     0.35   0.728    -.2670078    .3820009
        MFNS |  -.6817973   .0162935   -41.84   0.000    -.7137387   -.6498558
        MFSH |   -.693151   .0382083   -18.14   0.000    -.7680536   -.6182484
       _cons |   1.376961    .047161    29.20   0.000     1.284508    1.469414
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 24,  5753) =   82.03
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1962
                                                       Root MSE      =  .85272

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0446523   .0699643    -0.64   0.523    -.1818087    .0925042
         d1b |   .0429803   .0864367     0.50   0.619    -.1264681    .2124288
          d2 |   -.059839   .0708276    -0.84   0.398    -.1986878    .0790098
          d3 |   .0133764   .0717982     0.19   0.852    -.1273751    .1541279
          d4 |  -.0604688    .070141    -0.86   0.389    -.1979716     .077034
          d5 |    -.04231   .0843274    -0.50   0.616    -.2076235    .1230034
          d6 |  -.0563786   .0724076    -0.78   0.436    -.1983248    .0855675
          d7 |   .1025978   .1009615     1.02   0.310    -.0953248    .3005204
          d8 |   .0040654   .0787831     0.05   0.959    -.1503791      .15851
          f5 |  -.1007172   .0876376    -1.15   0.251    -.2725199    .0710856
          f6 |  -.1177322   .0772939    -1.52   0.128    -.2692574     .033793
          f7 |  -.0352299   .0891525    -0.40   0.693    -.2100024    .1395426
          l1 |   -.037203   .0818756    -0.45   0.650      -.19771     .123304
```

l1b	-.0133761	.0844352	-0.16	0.874	-.1789009	.1521488
l2	.0337845	.0725835	0.47	0.642	-.1085066	.1760755
l3	.0507745	.0851313	0.60	0.551	-.1161148	.2176639
l4	-.0125916	.0768681	-0.16	0.870	-.163282	.1380987
l5	-.0055851	.0733669	-0.08	0.939	-.1494118	.1382416
l5b	-.1222212	.0823979	-1.48	0.138	-.2837522	.0393097
l6	-.095426	.0845079	-1.13	0.259	-.2610932	.0702412
l6b	-.0156815	.0907839	-0.17	0.863	-.193652	.1622891
SFSH	.0793161	.2171621	0.37	0.715	-.3464034	.5050356
MFNS	-.8706515	.0200616	-43.40	0.000	-.9099798	-.8313232
MFSH	-.8448344	.0469242	-18.00	0.000	-.9368235	-.7528453
_cons	1.563509	.0589754	26.51	0.000	1.447895	1.679123

- Linear regression model using robust standard errors where the dependent variable is event_peak.

Linear regression

Number of obs	=	5778
F(24, 5753)	=	83.47
Prob > F	=	0.0000
R-squared	=	0.2000
Root MSE	=	1.193

event_peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
d1	-.1962301	.1049474	-1.87	0.062	-.4019665	.0095063
d1b	-.0915712	.1279312	-0.72	0.474	-.3423645	.1592221
d2	-.2461135	.105422	-2.33	0.020	-.4527804	-.0394467
d3	-.1254111	.1082759	-1.16	0.247	-.3376726	.0868504
d4	-.2224064	.1052102	-2.11	0.035	-.4286581	-.0161548
d5	-.1661746	.1226404	-1.35	0.175	-.406596	.0742468
d6	-.1661376	.1078337	-1.54	0.123	-.3775322	.045257
d7	.0289863	.1429066	0.20	0.839	-.2511645	.3091371
d8	-.0997627	.1192474	-0.84	0.403	-.3335324	.1340071
f5	-.2701843	.1252114	-2.16	0.031	-.5156459	-.0247228
f6	-.1951262	.1170832	-1.67	0.096	-.4246533	.0344009
f7	-.1041109	.131244	-0.79	0.428	-.3613985	.1531767
l1	-.1452318	.119816	-1.21	0.226	-.3801163	.0896526
l1b	-.0931279	.1250321	-0.74	0.456	-.3382379	.1519821
l2	-.0796203	.1080523	-0.74	0.461	-.2914435	.1322028
l3	-.0165419	.1272909	-0.13	0.897	-.26608	.2329961
l4	-.1124681	.1157897	-0.97	0.331	-.3394595	.1145232
l5	-.0818353	.1104286	-0.74	0.459	-.298317	.1346464
l5b	-.2270923	.1231916	-1.84	0.065	-.4685943	.0144096
l6	-.2254398	.123368	-1.83	0.068	-.4672875	.0164078
l6b	-.1350894	.1258541	-1.07	0.283	-.3818107	.1116319

```
        SFSH |  -.0858568   .2684827    -0.32   0.749    -.612184    .4404703
        MFNS |  -1.232571   .0280291   -43.97   0.000   -1.287519   -1.177624
        MFSH |  -1.200612   .0679364   -17.67   0.000   -1.333793   -1.067431
       _cons |   2.231657   .0912756    24.45   0.000    2.052722    2.410591
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 24,  5753) =   16.97
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0634
                                                       Root MSE      =  .28918

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0142498   .0256993    -0.55   0.579   -.0646301    .0361306
         d1b |   .0180118   .0306166     0.59   0.556   -.0420082    .0780319
          d2 |   .0099118   .0266862     0.37   0.710   -.0424031    .0622267
          d3 |   .0112119   .0263333     0.43   0.670   -.0404112    .0628351
          d4 |   .0014913   .0264551     0.06   0.955   -.0503707    .0533532
          d5 |  -.0085117   .0292595    -0.29   0.771   -.0658713    .0488479
          d6 |    .015164   .0263682     0.58   0.565   -.0365276    .0668556
          d7 |   .0217242   .0310317     0.70   0.484   -.0391096     .082558
          d8 |  -.0122294   .0289322    -0.42   0.673   -.0689474    .0444887
          f5 |   .0104642   .0311491     0.34   0.737   -.0505997    .0715282
          f6 |  -.0130105   .0284155    -0.46   0.647   -.0687156    .0426946
          f7 |   .0100647   .0312444     0.32   0.747    -.051186    .0713154
          l1 |   .0201179   .0325634     0.62   0.537   -.0437186    .0839545
         l1b |   .0622609   .0309679     2.01   0.044    .0015521    .1229697
          l2 |   .0406689   .0267146     1.52   0.128   -.0117019    .0930396
          l3 |   .0451523   .0311339     1.45   0.147   -.0158819    .1061865
          l4 |  -.0152824   .0303496    -0.50   0.615    -.074779    .0442142
          l5 |  -.0177653   .0260098    -0.68   0.495   -.0687544    .0332237
         l5b |  -.0079922   .0302553    -0.26   0.792   -.0673041    .0513197
          l6 |  -.0074864   .0303648    -0.25   0.805   -.0670128      .05204
         l6b |  -.0103983   .0315635    -0.33   0.742   -.0722745     .051478
        SFSH |   .0310729   .0691484     0.45   0.653    -.104484    .1666299
        MFNS |  -.1527529   .0079664   -19.17   0.000   -.1683701   -.1371358
        MFSH |  -.0585445   .0355091    -1.65   0.099   -.1281557    .0110666
       _cons |   1.118642   .0223589    50.03   0.000     1.07481    1.162474
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 24,  5446) =   58.36
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1739
                                                       Root MSE      =  .51402

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0069371   .0431134    -0.16   0.872    -.0914566    .0775825
         d1b |   .0629582   .0581884     1.08   0.279    -.0511143    .1770308
          d2 |  -.0426625   .0428988    -0.99   0.320    -.1267614    .0414363
          d3 |   .0254058   .0439032     0.58   0.563    -.0606621    .1114737
          d4 |  -.0236758    .044167    -0.54   0.592    -.1102607    .0629091
          d5 |  -.0125382   .0487774    -0.26   0.797    -.1081614     .083085
          d6 |  -.0040734   .0426127    -0.10   0.924    -.0876114    .0794646
          d7 |  -.0009538   .0540549    -0.02   0.986     -.106923    .1050154
          d8 |  -.0304966   .0455816    -0.67   0.503    -.1198549    .0588616
          f5 |  -.0270874   .0600119    -0.45   0.652    -.1447348    .0905601
          f6 |  -.0393159   .0505017    -0.78   0.436    -.1383194    .0596876
          f7 |  -.0547306   .0536419    -1.02   0.308    -.1598901    .0504288
          l1 |  -.0192199   .0516137    -0.37   0.710    -.1204035    .0819637
         l1b |  -.0067823   .0572351    -0.12   0.906     -.118986    .1054214
          l2 |  -.0141848   .0430263    -0.33   0.742    -.0985335    .0701639
          l3 |   .0042509   .0509563     0.08   0.934    -.0956437    .1041455
          l4 |  -.0450907   .0458147    -0.98   0.325    -.1349058    .0447244
          l5 |   .0094901   .0458299     0.21   0.836    -.0803548     .099335
         l5b |   -.071165   .0516793    -1.38   0.169    -.1724771    .0301471
          l6 |  -.0459642   .0504154    -0.91   0.362    -.1447986    .0528702
         l6b |   -.048925   .0505779    -0.97   0.333    -.1480778    .0502278
        SFSH |   1.399526   .4083363     3.43   0.001     .5990231    2.200028
        MFNS |  -.4398834    .012627   -34.84   0.000    -.4646372   -.4151295
        MFSH |   .4953761   .0709534     6.98   0.000     .3562792    .6344731
       _cons |   .9336954   .0355397    26.27   0.000     .8640234    1.003367
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 24,  5446) =   53.69
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1624
                                                       Root MSE      =  .50284

------------------------------------------------------------------------------
             |               Robust
```

peak	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
d1	.015336	.042366	0.36	0.717	-.0677184	.0983904
d1b	.099634	.0587838	1.69	0.090	-.0156058	.2148738
d2	.0000941	.041989	0.00	0.998	-.0822212	.0824094
d3	.0556047	.0432852	1.28	0.199	-.0292517	.1404611
d4	-.000212	.0424045	-0.01	0.996	-.0833417	.0829177
d5	.0244977	.047575	0.51	0.607	-.0687682	.1177637
d6	.0247016	.0414914	0.60	0.552	-.0566381	.1060412
d7	.0330312	.0531065	0.62	0.534	-.0710789	.1371412
d8	-.0113671	.0432539	-0.26	0.793	-.0961621	.0734279
f5	-.0055938	.0582005	-0.10	0.923	-.11969	.1085025
f6	-.0281895	.0484022	-0.58	0.560	-.1230771	.0666981
f7	-.037171	.0508308	-0.73	0.465	-.1368197	.0624777
l1	.0121078	.0499559	0.24	0.809	-.0858257	.1100413
l1b	.0119573	.0550133	0.22	0.828	-.0958908	.1198054
l2	.0204734	.0420191	0.49	0.626	-.0619008	.1028476
l3	.0200513	.0492	0.41	0.684	-.0764003	.1165029
l4	-.0322114	.0463508	-0.69	0.487	-.1230776	.0586548
l5	.0097268	.0436583	0.22	0.824	-.0758609	.0953145
l5b	-.0601728	.0498185	-1.21	0.227	-.1578369	.0374914
l6	-.022767	.0506312	-0.45	0.653	-.1220243	.0764904
l6b	-.0322395	.0513453	-0.63	0.530	-.1328968	.0684177
SFSH	1.381667	.4001911	3.45	0.001	.5971321	2.166201
MFNS	-.41329	.0123436	-33.48	0.000	-.4374884	-.3890916
MFSH	.4370783	.0726694	6.01	0.000	.2946173	.5795393
_cons	.8444059	.0345004	24.48	0.000	.7767713	.9120404

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 24,  5446) =    1.92
                                                       Prob > F      =  0.0046
                                                       R-squared     =  0.0079
                                                       Root MSE      =  .20425
```

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
d1	.0264767	.0181781	1.46	0.145	-.0091597	.062113
d1b	.0422626	.0221259	1.91	0.056	-.0011131	.0856383
d2	.0568183	.0191132	2.97	0.003	.0193488	.0942877
d3	.0457272	.0180115	2.54	0.011	.0104174	.081037
d4	.0397216	.0183571	2.16	0.031	.0037343	.0757088
d5	.0596847	.0205354	2.91	0.004	.019427	.0999423

```
          d6 |   .0428746   .0179277     2.39   0.017     .0077293      .07802
          d7 |   .0613228   .0212656     2.88   0.004     .0196338    .1030119
          d8 |   .0410839   .0202825     2.03   0.043     .0013221    .0808458
          f5 |   .0332549   .0217182     1.53   0.126    -.0093214    .0758313
          f6 |   .0220433   .0210975     1.04   0.296    -.0193162    .0634029
          f7 |   .0306537   .0256238     1.20   0.232    -.0195792    .0808867
          l1 |    .041344   .0214291     1.93   0.054    -.0006656    .0833537
         l1b |   .0447916   .0201586     2.22   0.026     .0052727    .0843106
          l2 |   .0471746   .0177117     2.66   0.008     .0124526    .0818966
          l3 |   .0411407   .0219277     1.88   0.061    -.0018463    .0841277
          l4 |   .0033503   .0211581     0.16   0.874    -.0381281    .0448287
          l5 |   .0053939   .0177903     0.30   0.762    -.0294821    .0402699
         l5b |   .0069775   .0209212     0.33   0.739    -.0340363    .0479914
          l6 |   .0255956   .0227472     1.13   0.261    -.0189979    .0701891
         l6b |   .0052535   .0216055     0.24   0.808     -.037102     .047609
        SFSH |   .0536659   .0421219     1.27   0.203    -.0289098    .1362416
        MFNS |  -.0006068   .0067633    -0.09   0.929    -.0138657     .012652
        MFSH |  -.0138193   .0247293    -0.56   0.576    -.0622987    .0346601
       _cons |   .9040085    .015105    59.85   0.000     .8743967    .9336203
------------------------------------------------------------------------------
```

Table A-11 Impacts of Technology on Customer Satisfaction

Table A-11 contains results from a linear regression model using robust standard errors where the dependent variable is satisfaction. There is one observation per customer; and customers are excluded if they did not answer questions 22 and 23 on the CAP final survey, if they are in any of the eWeb technology treatment cells, or if they did not implement their in-home device. The control group consists of customers with the FLR rate treatment who implemented BIHDs and reside in single-family homes with non-space heating.

```
Linear regression                                      Number of obs =     497
                                                       F( 11,   485) =    1.83
                                                       Prob > F      =  0.0467
                                                       R-squared     =  0.0263
                                                       Root MSE      =  2.5174

------------------------------------------------------------------------------
             |               Robust
satisfaction |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |  -.1781452   .4362013    -0.41   0.683    -1.035223    .6789325
         dap |   .0362707   .4245307     0.09   0.932    -.7978758    .8704172
         ptr |   .0374555   .4418715     0.08   0.932    -.8307633    .9056744
         tou |  -.0980411   .4441475    -0.22   0.825    -.9707319    .7746497
         ibr |   .0028663   .4697526     0.01   0.995    -.9201351    .9258678
        aihd |  -.0976615   .2791738    -0.35   0.727     -.646201     .450878
         pct |  -.1063114   .4189654    -0.25   0.800    -.9295228    .7169001
```

```
   bill_prot |  (omitted)
  purch_tech |   1.662707   .5710576     2.91   0.004     .5406547    2.784759
   full_educ |  (omitted)
        SFSH |  -.1943091   .3659988    -0.53   0.596    -.9134481      .52483
        MFNS |   .2093658   .2767308     0.76   0.450    -.3343735    .7531052
        MFSH |   -2.59953     .72739    -3.57   0.000    -4.028755   -1.170305
       _cons |    6.06781   .3520157    17.24   0.000     5.376145    6.759474
------------------------------------------------------------------------------
```

Table A-13 Usage Comparisons by Method of Obtaining Technology

Table A-13 contains the results of seven models detailed below. Each model contains one observation per customer; and customers are included in the sample if they are in treatment cell L5a, L5b, L6a, or L6b and were not screened due to data problems discussed above. The control group consists of customers in treatment cell L5a.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     994
                                                       F(  5,   988) =   44.82
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1405
                                                       Root MSE      =   .7154

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        aihd |  -.0151349   .0467296    -0.32   0.746    -.1068355    .0765657
  purch_tech |  -.0396389   .0461678    -0.86   0.391    -.1302372    .0509593
        SFSH |  -.1970149    .278176    -0.71   0.479    -.7428987    .3488688
        MFNS |  -.6016144   .0415246   -14.49   0.000    -.6831009   -.5201279
        MFSH |   -.650667   .0886095    -7.34   0.000    -.8245513   -.4767826
       _cons |   1.349911    .041098    32.85   0.000     1.269262     1.43056
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     994
                                                       F(  5,   988) =   48.67
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1444
                                                       Root MSE      =  .89517

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
        aihd |  -.0100781   .0586818    -0.17   0.864    -.1252334    .1050771
  purch_tech |  -.0318605   .0579914    -0.55   0.583     -.145661      .08194
        SFSH |  -.0847893   .4250646    -0.20   0.842    -.9189224    .7493439
        MFNS |  -.7657046   .0510266   -15.01   0.000    -.8658377   -.6655716
        MFSH |  -.8281099   .0939817    -8.81   0.000    -1.012537   -.6436831
       _cons |   1.498176   .0507671    29.51   0.000     1.398552      1.5978
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =     994
                                                       F(  5,   988) =   54.91
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1583
                                                       Root MSE      =  1.2446

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        aihd |  -.0468312   .0804353    -0.58   0.561    -.2046749    .1110126
  purch_tech |  -.0442116    .080332    -0.55   0.582    -.2018525    .1134293
        SFSH |  -.3041675    .717315    -0.42   0.672    -1.711804    1.103469
        MFNS |  -1.121033    .070334   -15.94   0.000    -1.259054   -.9830121
        MFSH |  -1.230004   .1289657    -9.54   0.000    -1.483082   -.9769257
       _cons |    2.08364   .0729903    28.55   0.000     1.940406    2.226874
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     994
                                                       F(  5,   988) =    8.76
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0428
                                                       Root MSE      =  .28651

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        aihd |   .0058655   .0192588     0.30   0.761    -.0319273    .0436584
  purch_tech |   .0057166   .0191911     0.30   0.766    -.0319434    .0433766
        SFSH |   .1855907    .153251     1.21   0.226    -.1151441    .4863255
        MFNS |  -.1230944   .0195157    -6.31   0.000    -.1613914   -.0847974
        MFSH |  -.1346349   .0701891    -1.92   0.055    -.2723717     .003102
```

```
       _cons |   1.092526   .0139409    78.37   0.000     1.065169    1.119883
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     946
                                                       F(  5,   940) =   51.47
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1587
                                                       Root MSE      =  .53865

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        aihd |  -.0260395   .0349312    -0.75   0.456    -.0945917    .0425128
  purch_tech |  -.0470901   .0351729    -1.34   0.181    -.1161167    .0219365
        SFSH |   1.824674   .2762041     6.61   0.000     1.282626    2.366722
        MFNS |  -.4142263   .0322111   -12.86   0.000    -.4774404   -.3510123
        MFSH |   .6697406   .1569877     4.27   0.000     .3616537    .9778275
       _cons |   .9227198   .0307797    29.98   0.000     .8623149    .9831247
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     946
                                                       F(  5,   940) =   41.87
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1428
                                                       Root MSE      =  .52203

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        aihd |  -.0091079   .0348789    -0.26   0.794    -.0775575    .0593417
  purch_tech |  -.0438395   .0346194    -1.27   0.206    -.1117798    .0241008
        SFSH |   1.746523   .3673565     4.75   0.000     1.025589    2.467457
        MFNS |  -.3839528   .0312831   -12.27   0.000    -.4453456   -.3225601
        MFSH |   .5357058     .14653     3.66   0.000     .2481419    .8232696
       _cons |   .8357795   .0287632    29.06   0.000      .779332     .892227
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     946
                                                       F(  5,   940) =    0.49
                                                       Prob > F      =  0.7846
                                                       R-squared     =  0.0022
                                                       Root MSE      =  .20229

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        aihd |   .0118941   .0145487     0.82   0.414    -.0166576    .0404457
  purch_tech |  -.0076105   .0139546    -0.55   0.586    -.0349962    .0197752
        SFSH |   .0393805   .0542662     0.73   0.468    -.0671165    .1458775
        MFNS |  -.0015096   .0164412    -0.09   0.927    -.0337754    .0307561
        MFSH |  -.0592436   .0517111    -1.15   0.252    -.1607262    .0422389
       _cons |   .9129156    .009291    98.26   0.000     .8946821     .931149
------------------------------------------------------------------------------
```

Table A-14 Impact of Bill Protection on Opt-Out Rates

Table A-14 contains the results of a logistic regression using robust standard errors where the dependent variable is optout. There is one observation per customer; and customers are included in the sample if they are in treatment cells D1a, D1b, L1a, or L1b and did not final before or during the pilot program. Because there are no customers who opted out of the pilot program with either SFSH or MFSH housing, coefficients could not be estimated for these variables and customers with SFSH or MFSH housing were not included in the regression. The control group consists of customers in treatment cell D1a residing in single-family homes with non-space heating.

```
Logistic regression                               Number of obs   =       1119
                                                  Wald chi2(3)    =       5.80
                                                  Prob > chi2     =     0.1216
Log pseudolikelihood = -141.67836                 Pseudo R2       =     0.0248

------------------------------------------------------------------------------
             |               Robust
      optout |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         dap |  -.8889138   .4607828    -1.93   0.054    -1.792032    .0142039
   bill_prot |   .1883832   .3734056     0.50   0.614    -.5434784    .9202448
        SFSH |  (omitted)
        MFNS |   -.625779    .412085    -1.52   0.129    -1.433451    .1818928
        MFSH |  (omitted)
       _cons |  -3.157204   .2559411   -12.34   0.000     -3.65884   -2.655569
```

Table A-15 Usage Comparisons by Notification of Bill Protection

Table A-15 contains the results of seven models detailed below. Each model contains one observation per customer; and customers are included in the sample if they are in treatment cells D1a, D1b, L1a, or L1b and were not screened due to data problems discussed above. The control group consists of customers in treatment cell L1a residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     975
                                                       F(  5,   969) =   72.03
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2210
                                                       Root MSE      =  .64861
------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0362137   .0438821     0.83   0.409    -.0499012    .1223286
   bill_prot |   .0403229   .0443762     0.91   0.364    -.0467616    .1274073
        SFSH |   .5282667   .2406385     2.20   0.028     .0560341    1.000499
        MFNS |  -.6988686   .0383554   -18.22   0.000    -.7741377   -.6235994
        MFSH |  -.6560936   .0762775    -8.60   0.000    -.8057818   -.5064054
       _cons |   1.325295   .0472948    28.02   0.000     1.232483    1.418107
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     975
                                                       F(  5,   969) =   74.95
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2279
                                                       Root MSE      =  .81367
------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0161928   .0548091     0.30   0.768    -.0913654    .1237511
   bill_prot |   .0621061   .0559062     1.11   0.267    -.0476051    .1718173
        SFSH |   .6492782   .5079633     1.28   0.201    -.3475567    1.646113
        MFNS |  -.8994892   .0470749   -19.11   0.000    -.9918696   -.8071087
        MFSH |  -.7891304   .0995818    -7.92   0.000    -.9845513   -.5937095
       _cons |   1.515984   .0590176    25.69   0.000     1.400166    1.631801
```

```
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =     975
                                                       F(  5,   969) =   71.30
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2192
                                                       Root MSE      =  1.1401

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |  -.0305884   .0766627    -0.40   0.690    -.1810325    .1198557
   bill_prot |   .0845996   .0787086     1.07   0.283    -.0698594    .2390586
        SFSH |   .4402352   .5725555     0.77   0.442    -.6833563    1.563827
        MFNS |  -1.234347   .0661066   -18.67   0.000    -1.364075   -1.104618
        MFSH |  -1.094191   .1469172    -7.45   0.000    -1.382504    -.805879
       _cons |   2.066885   .0815548    25.34   0.000     1.906841     2.22693
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     975
                                                       F(  5,   969) =   18.55
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0752
                                                       Root MSE      =  .28593

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |  -.0380074   .0198615    -1.91   0.056    -.0769838     .000969
   bill_prot |   .0366633   .0196299     1.87   0.062    -.0018587    .0751853
        SFSH |   .0311622   .1819783     0.17   0.864    -.3259548    .3882792
        MFNS |  -.1586222   .0179039    -8.86   0.000     -.193757   -.1234874
        MFSH |   .0005692   .0976498     0.01   0.995    -.1910603    .1921988
       _cons |   1.141515   .0199228    57.30   0.000     1.102419    1.180612
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     917
                                                       F(  5,   911) =   61.73
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2292
                                                       Root MSE      =   .5375

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0324057   .0372427     0.87   0.384    -.0406858    .1054972
   bill_prot |   .0439446   .0388616     1.13   0.258     -.032324    .1202133
        SFSH |   1.570928   .7318678     2.15   0.032     .1345853    3.007271
        MFNS |  -.5042466   .0305727   -16.49   0.000    -.5642478   -.4442455
        MFSH |    .567721   .1699335     3.34   0.001     .2342145    .9012276
       _cons |   .9197201   .0364256    25.25   0.000     .8482323    .9912079
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     917
                                                       F(  5,   911) =   63.45
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2291
                                                       Root MSE      =  .53295

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0332957   .0365108     0.91   0.362    -.0383594    .1049508
   bill_prot |   .0465763   .0386832     1.20   0.229    -.0293422    .1224947
        SFSH |   1.639486   .7946112     2.06   0.039      .080005    3.198967
        MFNS |  -.4982281   .0293812   -16.96   0.000    -.5558908   -.4405654
        MFSH |   .5496111   .1841485     2.98   0.003     .1882065    .9110157
       _cons |    .860196   .0347033    24.79   0.000     .7920882    .9283038
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     917
                                                       F(  5,   911) =    1.34
```

```
                                                       Prob > F      =  0.2444
                                                       R-squared     =  0.0075
                                                       Root MSE      =  .19861
------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |  -.0110638   .0137929    -0.80   0.423    -.0381333    .0160057
   bill_prot |   .0095236     .01403     0.68   0.497    -.0180113    .0370585
        SFSH |   .0419598   .1047551     0.40   0.689    -.1636295    .2475491
        MFNS |  -.0308243   .0152632    -2.02   0.044    -.0607793   -.0008692
        MFSH |   .0130922   .0429913     0.30   0.761    -.0712813    .0974658
       _cons |   .9524942   .0133731    71.22   0.000     .9262487    .9787398
------------------------------------------------------------------------------
```

Table A-16 Impact of Bill Protection on Customer Satisfaction

Table A-16 contains results from a linear regression model using robust standard errors where the dependent variable is satisfaction. There is one observation per customer; and customers are included if they are in treatment cells D1a, D1b, L1a, or L1b and if they answered questions 22 and 23 on the CAP final survey. The control group consists of customers in treatment cell L1a residing in single-family homes with non-space heating.

```
Linear regression                                      Number of obs =     305
                                                       F(  4,   299) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0132
                                                       Root MSE      =   2.332

------------------------------------------------------------------------------
             |               Robust
satisfaction |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         dap |   .3485595   .2679728     1.30   0.194    -.1787921    .8759111
   bill_prot |   .2773093   .2905516     0.95   0.341    -.2944758    .8490943
        SFSH |  -1.707127   .2245586    -7.60   0.000    -2.149042   -1.265211
        MFNS |   .2115115   .2802543     0.75   0.451    -.3400092    .7630323
        MFSH |   .1122209   .8163672     0.14   0.891    -1.494332    1.718774
       _cons |   5.707127   .2245586    25.41   0.000     5.265211    6.149042
------------------------------------------------------------------------------
```

Table A-17 Impact of Customer Education on Usage

Table A-17contains results for seven models detailed below. Each model contains one observation per customer; and customers are included in the sample if they are in treatment cells F1 or F2 and were not screened due to data problems discussed above. Customers in treatment cell F1 residing in single-family homes with non-space heating serve as the control group.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     487
                                                       F(  4,   482) =    4.97
                                                       Prob > F      =  0.0006
                                                       R-squared     =  0.0447
                                                       Root MSE      =  1.8218

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f2 |   .0033746   .1681295     0.02   0.984    -.3269826    .3337319
        SFSH |   .4894513   .2771583     1.77   0.078    -.0551364    1.034039
        MFNS |  -.3887967   .2539147    -1.53   0.126    -.8877132    .1101198
        MFSH |  -.5461724   .1968789    -2.77   0.006    -.9330193   -.1593254
       _cons |   2.234744   .1515827    14.74   0.000     1.936899    2.532588
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     487
                                                       F(  4,   482) =    6.52
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0534
                                                       Root MSE      =  2.2866

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f2 |   .0049887   .2096145     0.02   0.981    -.4068823    .4168598
        SFSH |    .412453   .3500938     1.18   0.239    -.2754457    1.100352
        MFNS |   -.662834   .3181178    -2.08   0.038    -1.287903    -.037765
        MFSH |  -.9469324   .2478992    -3.82   0.000    -1.434029   -.4598358
       _cons |   2.751429   .1934964    14.22   0.000     2.371229     3.13163
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =     487
                                                       F(  4,   482) =    7.41
                                                       Prob > F      =  0.0000
```

```
                                                       R-squared     =  0.0546
                                                       Root MSE      =  2.8436

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f2 |   .0444072   .2622786     0.17   0.866    -.4709434    .5597577
        SFSH |   .1489784   .4108184     0.36   0.717    -.6582379    .9561947
        MFNS |  -.9600152   .4162317    -2.31   0.022    -1.777868   -.1421624
        MFSH |  -1.415206    .312515    -4.53   0.000    -2.029266    -.801146
       _cons |   3.628542   .2461556    14.74   0.000     3.144872    4.112213
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =     487
                                                       F(  4,   482) =    6.34
                                                       Prob > F      =  0.0001
                                                       R-squared     =  0.0463
                                                       Root MSE      =  .36185

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f2 |   .0251615   .0359833     0.70   0.485     -.045542     .095865
        SFSH |  -.0982014   .0447033    -2.20   0.029    -.1860388    -.010364
        MFNS |  -.1651221   .0510938    -3.23   0.001    -.2655161   -.0647281
        MFSH |  -.1963041   .0426068    -4.61   0.000    -.2800221    -.112586
       _cons |   1.310522   .0342361    38.28   0.000     1.243251    1.377792
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     459
                                                       F(  4,   454) =   42.87
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2861
                                                       Root MSE      =  2.7503

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f2 |   .3541414    .291009     1.22   0.224    -.2177502    .9260331
        SFSH |   4.305792   .4719861     9.12   0.000     3.378244    5.233341
```

```
        MFNS |  -.5339999   .1968817    -2.71   0.007    -.9209123   -.1470875
        MFSH |   1.842181   .3072327     6.00   0.000     1.238407    2.445956
       _cons |    1.44123   .1624193     8.87   0.000     1.122043    1.760417
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     459
                                                       F(  4,   454) =   42.31
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2771
                                                       Root MSE      =  2.4714

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f2 |   .3122167   .2588613     1.21   0.228    -.1964982    .8209316
        SFSH |   3.746791   .4115381     9.10   0.000     2.938035    4.555547
        MFNS |  -.5035016   .1814471    -2.77   0.006     -.860082   -.1469211
        MFSH |   1.662403   .2816356     5.90   0.000     1.108932    2.215874
       _cons |   1.371474   .1475539     9.29   0.000     1.081501    1.661448
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =     459
                                                       F(  4,   454) =    4.50
                                                       Prob > F      =  0.0014
                                                       R-squared     =  0.0121
                                                       Root MSE      =  .31488

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f2 |   .0258206   .0373526     0.69   0.490    -.0475849    .0992261
        SFSH |  -.0846378   .0234881    -3.60   0.000    -.1307967   -.0384789
        MFNS |   .0090296   .0314678     0.29   0.774    -.0528111    .0708702
        MFSH |  -.0126505   .0435474    -0.29   0.772    -.0982299    .0729289
       _cons |   .9535851   .0236827    40.27   0.000     .9070438    1.000126
------------------------------------------------------------------------------
```

Table A-18 Impact of Technology and Customer Education Usage

Table A-18 contains results for seven models detailed below. Each model contains one observation per customer; and customers are included in the sample if they are in treatment cell F3 or if they do not pay a flat or IBR rate for electricity and have an AMI-enabled, enabling technology (cells D2, D3, D4, D6, D7, D8, L2, L3, L5a, and L6a) and they were not screened due to data problems discussed above. The control group consists of all non-F3 customers included in the sample residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    3817
                                                       F(  4,  3812) =  296.83
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1843
                                                       Root MSE      =  .68644

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f3 |   .0141122   .0478452     0.29   0.768    -.0796923    .1079168
        SFSH |   -.014146   .1913524    -0.07   0.941     -.389309    .3610171
        MFNS |  -.6863425   .0202491   -33.89   0.000    -.7260426   -.6466424
        MFSH |  -.6946763   .0526163   -13.20   0.000     -.797835   -.5915175
       _cons |   1.364288   .0159532    85.52   0.000      1.33301    1.395566
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    3817
                                                       F(  4,  3812) =  316.77
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1870
                                                       Root MSE      =  .86918

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f3 |   .0194563   .0598296     0.33   0.745    -.0978447    .1367573
        SFSH |  -.0314892   .2395979    -0.13   0.895    -.5012416    .4382632
        MFNS |  -.8786278    .025022   -35.11   0.000    -.9276855     -.82957
        MFSH |  -.8565815   .0613438   -13.96   0.000    -.9768513   -.7363117
       _cons |   1.546832   .0204892    75.49   0.000     1.506661    1.587003
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    3817
                                                       F(  4,  3812) =  327.77
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1918
                                                       Root MSE      =  1.2144

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f3 |   .1409004   .0919728     1.53   0.126    -.0394202    .3212209
        SFSH |  -.1920607   .3123397    -0.61   0.539    -.8044298    .4203084
        MFNS |  -1.246523   .0348103   -35.81   0.000    -1.314771   -1.178274
        MFSH |  -1.198087   .0858871   -13.95   0.000    -1.366476   -1.029698
       _cons |   2.094973   .0285584    73.36   0.000     2.038982    2.150964
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    3817
                                                       F(  4,  3812) =   62.96
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0605
                                                       Root MSE      =  .29184

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          f3 |  -.0083614   .0226783    -0.37   0.712    -.0528242    .0361013
        SFSH |   .0057683   .0730173     0.08   0.937    -.1373885     .148925
        MFNS |  -.1585724   .0100109   -15.84   0.000    -.1781996   -.1389452
        MFSH |  -.0683228    .041221    -1.66   0.098    -.1491401    .0124945
       _cons |   1.129065   .0059809   188.78   0.000     1.117339    1.140791
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    3645
                                                       F(  4,  3640) =  205.78
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1592
                                                       Root MSE      =  .50953
```

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
f3	.0162672	.0361779	0.45	0.653	-.0546638	.0871983
SFSH	1.330123	.4879756	2.73	0.006	.3733905	2.286856
MFNS	-.4268669	.0155722	-27.41	0.000	-.4573979	-.3963358
MFSH	.4870537	.0909944	5.35	0.000	.3086487	.6654587
_cons	.9143907	.0112604	81.20	0.000	.8923135	.936468

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    3645
                                                       F(  4,  3640) =  184.76
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1465
                                                       Root MSE      =  .49731
```

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
f3	-.0083569	.0351215	-0.24	0.812	-.0772168	.0605029
SFSH	1.279797	.4559851	2.81	0.005	.3857854	2.173809
MFNS	-.3970409	.0152427	-26.05	0.000	-.426926	-.3671558
MFSH	.4382883	.0903502	4.85	0.000	.2611463	.6154303
_cons	.848613	.0109792	77.29	0.000	.8270869	.8701391

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    3645
                                                       F(  4,  3640) =    1.86
                                                       Prob > F      =  0.1144
                                                       R-squared     =  0.0016
                                                       Root MSE      =  .20314
```

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
f3	-.0367188	.0154422	-2.38	0.017	-.066995	-.0064426
SFSH	.0578498	.0450624	1.28	0.199	-.0305002	.1461998
MFNS	.000693	.0082829	0.08	0.933	-.0155467	.0169327

```
        MFSH |  -.0037378   .0363325    -0.10   0.918    -.0749719    .0674962
       _cons |   .9400871    .003651   257.49   0.000      .932929    .9472453
------------------------------------------------------------------------------
```

Table A-19 Impact of Technology and Customer Education on Usage

Table A-19 contains results for seven models detailed below. Each model contains one observation per customer; and customers are included in the sample if they face the flat rate and were offered an in-home device (treatment cells F6 and F7) or were offered an in-home device but who do not pay the FLR or IBR rates (treatment cells D2, D3, D4, D6, D7, D8, L2, L3, L5a, and L6a). Customers were excluded if they had data problems discussed above. The control group consists of customers in the sample described above, residing in single-family homes with non-space heating, and in treatment cells other than F6 or F7.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    4068
                                                       F(  4,  4063) =  324.74
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1854
                                                       Root MSE      =  .68989

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    f6_or_f7 |  -.0513725    .035344    -1.45   0.146     -.120666    .0179211
        SFSH |  -.0160121   .1913241    -0.08   0.933    -.3911123     .359088
        MFNS |  -.6914006   .0195287   -35.40   0.000    -.7296875   -.6531136
        MFSH |   -.706567    .051407   -13.74   0.000    -.8073529   -.6057811
       _cons |   1.366154    .015704    86.99   0.000     1.335366    1.396943
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    4068
                                                       F(  4,  4063) =  342.90
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1871
                                                       Root MSE      =  .87133

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    f6_or_f7 |  -.0622742   .0436263    -1.43   0.154    -.1478057    .0232572
        SFSH |  -.0321476   .2395599    -0.13   0.893    -.5018163    .4375212
```

```
        MFNS |  -.8791614   .0241078   -36.47   0.000    -.9264259    -.831897
        MFSH |  -.8839756   .0569771   -15.51   0.000     -.995682   -.7722692
       _cons |    1.54749    .020155    76.78   0.000     1.507976    1.587005
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    4068
                                                       F(  4,  4063) =  355.22
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1923
                                                       Root MSE      =  1.2167

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    f6_or_f7 |  -.0142979   .0626492    -0.23   0.819    -.1371247    .1085288
        SFSH |  -.1942377   .3122854    -0.62   0.534    -.8064882    .4180128
        MFNS |  -1.250981   .0335877   -37.25   0.000    -1.316832   -1.185131
        MFSH |    -1.2387   .0810815   -15.28   0.000    -1.397664   -1.079736
       _cons |    2.09715   .0280974    74.64   0.000     2.042063    2.152236
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    4068
                                                       F(  4,  4063) =   61.44
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0568
                                                       Root MSE      =  .29109

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    f6_or_f7 |  -.0113031    .014669    -0.77   0.441    -.0400625    .0174562
        SFSH |   .0074559   .0730096     0.10   0.919    -.1356828    .1505947
        MFNS |  -.1524147    .009754   -15.63   0.000    -.1715379   -.1332915
        MFSH |  -.0869401    .038043    -2.29   0.022    -.1615252   -.0123549
       _cons |   1.127377    .005922   190.37   0.000     1.115767    1.138988
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    3866
                                                       F(  4,  3861) =  220.40
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1556
                                                       Root MSE      =  .51388

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    f6_or_f7 |  -.0301669   .0283237    -1.07   0.287    -.0856977     .025364
        SFSH |   1.329492   .4879533     2.72   0.006     .3728216    2.286163
        MFNS |  -.4283282   .0151086   -28.35   0.000    -.4579499   -.3987065
        MFSH |   .4759628   .0885941     5.37   0.000      .302267    .6496586
       _cons |   .9150217    .011121    82.28   0.000     .8932181    .9368252
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    3866
                                                       F(  4,  3861) =  196.52
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1432
                                                       Root MSE      =  .49971

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    f6_or_f7 |  -.0408167    .026718    -1.53   0.127    -.0931994    .0115661
        SFSH |   1.279661   .4559639     2.81   0.005     .3857077    2.173614
        MFNS |  -.3965803   .0147927   -26.81   0.000    -.4255825   -.3675781
        MFSH |   .4223707   .0865876     4.88   0.000     .2526089    .5921325
       _cons |   .8487493   .0108402    78.30   0.000     .8274962    .8700025
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    3866
                                                       F(  4,  3861) =    0.73
                                                       Prob > F      =  0.5722
                                                       R-squared     =  0.0005
                                                       Root MSE      =   .2075

------------------------------------------------------------------------------
             |               Robust
```

peak_offpeak	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
f6_or_f7	-.0107952	.012745	-0.85	0.397	-.0357829	.0141924
SFSH	.0589104	.0450648	1.31	0.191	-.0294427	.1472635
MFNS	.0043848	.0083598	0.52	0.600	-.0120052	.0207748
MFSH	-.006611	.0353804	-0.19	0.852	-.0759771	.0627551
_cons	.9390266	.0037026	253.61	0.000	.9317673	.9462858

Table A-20 Impact of Customer Education on Customer Satisfaction

Table A-20 contains results from a linear regression model using robust standard errors where the dependent variable is satisfaction. There is one observation per customer; and customers are included if they are in treatment cells F1 or F2 and if they answered questions 22 and 23 on the CAP final survey. The control group consists of customers in treatment cell F1 residing in single-family homes with non-space heating.

Linear regression

Number of obs =	260
F(4, 255) =	1.16
Prob > F =	0.3270
R-squared =	0.0161
Root MSE =	2.3461

satisfaction	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
full_educ	.416456	.3073974	1.35	0.177	-.1889048	1.021817
SFSH	.2359148	.4019222	0.59	0.558	-.5555948	1.027424
MFNS	.5045852	.4358505	1.16	0.248	-.3537399	1.36291
MFSH	.5458293	.3851517	1.42	0.158	-.2126539	1.304313
_cons	5.097507	.2900901	17.57	0.000	4.52623	5.668785

Table A-21 Impact of Small Observable Steps on Electricity Usage

Table A-21 contains results for seven models detailed below. These models differ from those in Tables A-2 through A-4 in that they include independent variables that indicate the degree to which customers engaged in small observable steps (small_steps, steps_dummy). Each model has one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 15,  5762) =  122.61
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1912
                                                       Root MSE      =  .67712

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0453956     .03327     1.36   0.172    -.0198261    .1106172
         dap |   .0640629   .0360207     1.78   0.075    -.0065512     .134677
         ptr |   .0618029    .037001     1.67   0.095    -.0107331    .1343388
         tou |   .0709291   .0372628     1.90   0.057      -.00212    .1439781
        bihd |  -.0040973   .0245764    -0.17   0.868    -.0522762    .0440817
        aihd |   .0384583   .0276036     1.39   0.164    -.0156551    .0925718
         pct |   .0157455   .0346776     0.45   0.650    -.0522357    .0837266
   bill_prot |   .0240041   .0412091     0.58   0.560    -.0567811    .1047894
  purch_tech |  -.0561967    .043735    -1.28   0.199    -.1419336    .0295402
   full_educ |  -.0752144   .0570145    -1.32   0.187    -.1869843    .0365554
        SFSH |   .0548225   .1636509     0.33   0.738    -.2659948    .3756398
        MFNS |  -.6817373     .01647   -41.39   0.000    -.7140247   -.6494499
        MFSH |  -.6934431   .0380358   -18.23   0.000    -.7680075   -.6188786
 small_steps |  -.0118191    .008193    -1.44   0.149    -.0278805    .0042423
 steps_dummy |   .0433119   .0281063     1.54   0.123     -.011787    .0984108
       _cons |    1.36554   .0483875    28.22   0.000     1.270682    1.460398
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 15,  5762) =  130.19
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1958
                                                       Root MSE      =  .85223

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0622815   .0410484     1.52   0.129    -.0181888    .1427518
         dap |   .1029549   .0451507     2.28   0.023     .0144427    .1914672
         ptr |   .0849295   .0462695     1.84   0.066    -.0057762    .1756351
         tou |   .0678181   .0459483     1.48   0.140    -.0222578     .157894
        bihd |   .0118256   .0310415     0.38   0.703    -.0490275    .0726786
```

aihd	.0635516	.0349551	1.82	0.069	-.0049735	.1320767
pct	.0040829	.0413943	0.10	0.921	-.0770656	.0852314
bill_prot	.0404132	.0517599	0.78	0.435	-.0610557	.1418821
purch_tech	-.0597184	.0553706	-1.08	0.281	-.1682656	.0488288
full_educ	-.1038442	.070748	-1.47	0.142	-.2425368	.0348483
SFSH	.0718576	.2144839	0.34	0.738	-.3486114	.4923266
MFNS	-.8710325	.0202106	-43.10	0.000	-.9106528	-.8314122
MFSH	-.8432002	.0466166	-18.09	0.000	-.9345863	-.7518141
small_steps	-.0261683	.0105311	-2.48	0.013	-.0468133	-.0055233
steps_dummy	.0865973	.0358617	2.41	0.016	.0162948	.1568998
_cons	1.542836	.0601811	25.64	0.000	1.424858	1.660813

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 15,  5762) =  133.08
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1999
                                                       Root MSE      =  1.1921
```

event_peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0057625	.0576987	0.10	0.920	-.1073486	.1188736
dap	.1038188	.063457	1.64	0.102	-.0205807	.2282183
ptr	.0842372	.0645025	1.31	0.192	-.0422119	.2106863
tou	.0771156	.0650753	1.19	0.236	-.0504564	.2046877
bihd	.0220649	.0430077	0.51	0.608	-.0622464	.1063763
aihd	.0907838	.0485846	1.87	0.062	-.0044603	.1860279
pct	.0147206	.0580302	0.25	0.800	-.0990404	.1284817
bill_prot	.0759529	.0730601	1.04	0.299	-.0672722	.2191781
purch_tech	-.0822804	.0757893	-1.09	0.278	-.2308559	.0662951
full_educ	-.2177258	.1057057	-2.06	0.039	-.4249487	-.0105029
SFSH	-.1068238	.2661994	-0.40	0.688	-.6286747	.4150272
MFNS	-1.231057	.0281489	-43.73	0.000	-1.286239	-1.175874
MFSH	-1.198348	.0673553	-17.79	0.000	-1.33039	-1.066306
small_steps	-.0339111	.0150336	-2.26	0.024	-.0633826	-.0044396
steps_dummy	.1382992	.0502718	2.75	0.006	.0397476	.2368508
_cons	2.19157	.0927108	23.64	0.000	2.009822	2.373318

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

Linear regression

Number of obs =	5778
F(15, 5762) =	27.46
Prob > F =	0.0000
R-squared =	0.0641
Root MSE =	.28884

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0043468	.0139219	0.31	0.755	-.0229454	.031639
dap	.0376855	.0155942	2.42	0.016	.007115	.068256
ptr	.0078885	.0149932	0.53	0.599	-.0215037	.0372807
tou	-.0140457	.0153798	-0.91	0.361	-.0441959	.0161044
bihd	.01632	.0108092	1.51	0.131	-.0048702	.0375101
aihd	.020844	.0116985	1.78	0.075	-.0020895	.0437775
pct	.0049001	.0145905	0.34	0.737	-.0237028	.033503
bill_prot	.0300999	.0178658	1.68	0.092	-.0049238	.0651236
purch_tech	-.0016633	.0183901	-0.09	0.928	-.0377148	.0343881
full_educ	-.0081818	.0260299	-0.31	0.753	-.0592101	.0428465
SFSH	.0303267	.0695459	0.44	0.663	-.1060094	.1666627
MFNS	-.1536055	.0079951	-19.21	0.000	-.169279	-.1379321
MFSH	-.0570313	.0353629	-1.61	0.107	-.1263558	.0122932
small_steps	-.0102239	.0033649	-3.04	0.002	-.0168205	-.0036274
steps_dummy	.0238634	.0116236	2.05	0.040	.0010767	.0466502
_cons	1.115603	.02271	49.12	0.000	1.071082	1.160123

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

Linear regression

Number of obs =	5471
F(15, 5455) =	92.05
Prob > F =	0.0000
R-squared =	0.1731
Root MSE =	.51383

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0367092	.0274465	1.34	0.181	-.017097	.0905153
dap	.0237904	.0295438	0.81	0.421	-.0341272	.0817081
ptr	.0344085	.0289865	1.19	0.235	-.0224166	.0912336
tou	.024475	.0303356	0.81	0.420	-.0349948	.0839449
bihd	.004469	.0193615	0.23	0.817	-.0334873	.0424252
aihd	.0145059	.0213261	0.68	0.496	-.0273018	.0563135
pct	-.015315	.0261678	-0.59	0.558	-.0666144	.0359844
bill_prot	.0431901	.0365374	1.18	0.237	-.0284377	.114818
purch_tech	-.0487489	.0330146	-1.48	0.140	-.1134706	.0159728

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
full_educ	-.0470287	.0447206	-1.05	0.293	-.1346989	.0406414
SFSH	1.403728	.4095463	3.43	0.001	.6008538	2.206602
MFNS	-.4415425	.0127033	-34.76	0.000	-.466446	-.4166389
MFSH	.4926408	.0709536	6.94	0.000	.3535433	.6317382
small_steps	.0042056	.0064597	0.65	0.515	-.008458	.0168693
steps_dummy	-.029569	.021633	-1.37	0.172	-.0719784	.0128404
_cons	.945271	.0366944	25.76	0.000	.8733355	1.017207

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 15,  5455) =   84.45
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1618
                                                       Root MSE      =  .50262
```

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0542499	.0263966	2.06	0.040	.0025021	.1059977
dap	.03617	.0283389	1.28	0.202	-.0193855	.0917256
ptr	.0502279	.0277978	1.81	0.071	-.0042669	.1047227
tou	.0176503	.0290599	0.61	0.544	-.0393186	.0746193
bihd	.0069666	.0190234	0.37	0.714	-.0303269	.04426
aihd	.0168199	.0211743	0.79	0.427	-.0246901	.0583299
pct	-.02425	.0251111	-0.97	0.334	-.0734777	.0249778
bill_prot	.04079	.0363116	1.12	0.261	-.0303951	.1119752
purch_tech	-.0447081	.0326541	-1.37	0.171	-.1087233	.0193071
full_educ	-.0314043	.0432964	-0.73	0.468	-.1162825	.0534739
SFSH	1.383681	.401022	3.45	0.001	.5975181	2.169844
MFNS	-.4150643	.0124117	-33.44	0.000	-.4393962	-.3907323
MFSH	.4345683	.0726267	5.98	0.000	.292191	.5769456
small_steps	.0003554	.006248	0.06	0.955	-.011893	.0126039
steps_dummy	-.0183198	.0211832	-0.86	0.387	-.0598474	.0232078
_cons	.8536808	.035548	24.01	0.000	.7839925	.923369

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 15,  5455) =   84.45
                                                       Prob > F      =  0.0000
```

```
                                                       R-squared     =  0.1618
                                                       Root MSE      =  .50262
------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0542499   .0263966     2.06   0.040     .0025021    .1059977
         dap |     .03617   .0283389     1.28   0.202    -.0193855    .0917256
         ptr |   .0502279   .0277978     1.81   0.071    -.0042669    .1047227
         tou |   .0176503   .0290599     0.61   0.544    -.0393186    .0746193
        bihd |   .0069666   .0190234     0.37   0.714    -.0303269      .04426
        aihd |   .0168199   .0211743     0.79   0.427    -.0246901    .0583299
         pct |    -.02425   .0251111    -0.97   0.334    -.0734777    .0249778
   bill_prot |     .04079   .0363116     1.12   0.261    -.0303951    .1119752
  purch_tech |  -.0447081   .0326541    -1.37   0.171    -.1087233    .0193071
   full_educ |  -.0314043   .0432964    -0.73   0.468    -.1162825    .0534739
        SFSH |   1.383681    .401022     3.45   0.001     .5975181    2.169844
        MFNS |  -.4150643   .0124117   -33.44   0.000    -.4393962   -.3907323
        MFSH |   .4345683   .0726267     5.98   0.000      .292191    .5769456
 small_steps |   .0003554    .006248     0.06   0.955     -.011893    .0126039
 steps_dummy |  -.0183198   .0211832    -0.86   0.387    -.0598474    .0232078
       _cons |   .8536808    .035548    24.01   0.000     .7839925     .923369
------------------------------------------------------------------------------
```

Table A-22 Impact of Notification on Usage

Table A-22 contains results for seven models detailed below. These models differ from those in Tables A-2 through A-4 in that they include an independent variable indicating the degree to which customers were notified of the events (notify_share). Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed in the report. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,   5763) =  132.02
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1939
                                                       Root MSE      =  .67592
------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0403795   .0331336     1.22   0.223    -.0245748    .1053338
         dap |   .0620701    .035871     1.73   0.084    -.0082505    .1323907
```

	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ptr	.0597666	.0368825	1.62	0.105	-.0125369	.1320701
tou	.0684557	.0371282	1.84	0.065	-.0043295	.1412409
bihd	-.0098467	.0241742	-0.41	0.684	-.0572372	.0375438
aihd	.0328497	.0274663	1.20	0.232	-.0209946	.0866939
pct	.0134414	.0346158	0.39	0.698	-.0544187	.0813014
bill_prot	.0197524	.0410907	0.48	0.631	-.0608007	.1003056
purch_tech	-.0558353	.0434613	-1.28	0.199	-.1410358	.0293652
notify_share	.113343	.0233515	4.85	0.000	.0675652	.1591207
full_educ	-.1598553	.0590648	-2.71	0.007	-.2756446	-.0440661
SFSH	.0451975	.1619487	0.28	0.780	-.2722828	.3626779
MFNS	-.6794724	.0162878	-41.72	0.000	-.7114027	-.6475422
MFSH	-.686744	.0379732	-18.08	0.000	-.7611858	-.6123022
_cons	1.376068	.0471174	29.21	0.000	1.2837	1.468435

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,  5763) =  140.91
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1979
                                                       Root MSE      =  .85103
```

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.054199	.0409148	1.32	0.185	-.0260094	.1344073
dap	.0994449	.0450065	2.21	0.027	.0112154	.1876745
ptr	.0811372	.0461242	1.76	0.079	-.0092835	.171558
tou	.0624237	.0458223	1.36	0.173	-.0274052	.1522527
bihd	.0007981	.0304548	0.03	0.979	-.0589047	.0605009
aihd	.0543407	.0347864	1.56	0.118	-.0138536	.1225351
pct	-.000592	.0413889	-0.01	0.989	-.0817297	.0805458
bill_prot	.0351807	.0516681	0.68	0.496	-.0661082	.1364695
purch_tech	-.0570063	.0551467	-1.03	0.301	-.1651145	.051102
notify_share	.1427778	.0293455	4.87	0.000	.0852497	.200306
full_educ	-.2119524	.0732573	-2.89	0.004	-.3555642	-.0683407
SFSH	.063415	.2125524	0.30	0.765	-.3532676	.4800976
MFNS	-.8675572	.0200388	-43.29	0.000	-.9068407	-.8282737
MFSH	-.8359601	.0465131	-17.97	0.000	-.9271432	-.7447769
_cons	1.562311	.0589194	26.52	0.000	1.446807	1.677815

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,  5763) =  144.07
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2021
                                                       Root MSE      =  1.1904

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |  -.0046065   .0574715    -0.08   0.936    -.1172723    .1080593
         dap |   .0994861   .0632472     1.57   0.116    -.0245021    .2234743
         ptr |   .0791491   .0642505     1.23   0.218     -.046806    .2051042
         tou |   .0705132   .0649047     1.09   0.277    -.0567244    .1977507
        bihd |   .0107491   .0422106     0.25   0.799    -.0719996    .0934978
        aihd |   .0795429   .0483315     1.65   0.100    -.0152049    .1742907
         pct |    .009839   .0580478     0.17   0.865    -.1039565    .1236344
   bill_prot |   .0687087    .072915     0.94   0.346    -.0742321    .2116494
  purch_tech |  -.0822758   .0755331    -1.09   0.276     -.230349    .0657975
notify_share |   .2069597   .0409534     5.05   0.000     .1266756    .2872438
   full_educ |  -.3741578   .1092076    -3.43   0.001    -.5882458   -.1600699
        SFSH |  -.1148824   .2621147    -0.44   0.661    -.6287258     .398961
        MFNS |  -1.227877   .0279846   -43.88   0.000    -1.282737   -1.173016
        MFSH |  -1.187534   .0677012   -17.54   0.000    -1.320254   -1.054814
       _cons |   2.229849   .0911985    24.45   0.000     2.051066    2.408633
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,  5763) =   28.89
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0630
                                                       Root MSE      =  .28899

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0022807   .0138937     0.16   0.870    -.0249562    .0295176
         dap |   .0365937   .0155963     2.35   0.019     .0060191    .0671684
         ptr |   .0067152   .0149833     0.45   0.654    -.0226578    .0360882
         tou |  -.0162202    .015377    -1.05   0.292     -.046365    .0139246
        bihd |    .011896   .0106262     1.12   0.263    -.0089353    .0327273
        aihd |   .0182571   .0116592     1.57   0.117    -.0045994    .0411136
         pct |   .0029367   .0145571     0.20   0.840    -.0256006     .031474
   bill_prot |   .0297177   .0178734     1.66   0.096    -.0053209    .0647563
  purch_tech |   .0009824   .0183534     0.05   0.957    -.0349971     .036962
```

notify_share	.0102892	.0103923	0.99	0.322	-.0100837	.0306621
full_educ	-.017007	.0272886	-0.62	0.533	-.0705028	.0364889
SFSH	.0310646	.0695675	0.45	0.655	-.1053139	.167443
MFNS	-.1524855	.0079608	-19.15	0.000	-.1680915	-.1368794
MFSH	-.0573685	.0353014	-1.63	0.104	-.1265726	.0118356
_cons	1.118527	.0223383	50.07	0.000	1.074736	1.162319

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 14,  5456) =   98.75
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1738
                                                       Root MSE      =  .51356
```

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0351249	.0273785	1.28	0.200	-.0185479	.0887978
dap	.0224877	.0294718	0.76	0.445	-.0352887	.0802641
ptr	.0346515	.0289076	1.20	0.231	-.022019	.0913219
tou	.0240917	.0303014	0.80	0.427	-.0353111	.0834945
bihd	.001989	.0190536	0.10	0.917	-.0353635	.0393416
aihd	.0121358	.0211639	0.57	0.566	-.0293539	.0536255
pct	-.0159606	.0261782	-0.61	0.542	-.0672803	.035359
bill_prot	.0406314	.0365238	1.11	0.266	-.0309699	.1122326
purch_tech	-.0477429	.0329055	-1.45	0.147	-.1122507	.016765
notify_share	.0500962	.0180519	2.78	0.006	.0147072	.0854852
full_educ	-.0828619	.0467745	-1.77	0.077	-.1745586	.0088347
SFSH	1.394031	.4105451	3.40	0.001	.5891993	2.198864
MFNS	-.4394336	.0126161	-34.83	0.000	-.4641662	-.4147011
MFSH	.4962743	.0710352	6.99	0.000	.357017	.6355317
_cons	.9335538	.035507	26.29	0.000	.8639459	1.003162

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 14,  5456) =   90.32
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1621
                                                       Root MSE      =  .50247
```

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0524989	.0263715	1.99	0.047	.0008002	.1041977
dap	.0348539	.0283153	1.23	0.218	-.0206555	.0903632
ptr	.0501364	.0277605	1.81	0.071	-.0042853	.1045581
tou	.0167367	.0290688	0.58	0.565	-.0402498	.0737232
bihd	.0036276	.0187631	0.19	0.847	-.0331556	.0404109
aihd	.0143004	.0210209	0.68	0.496	-.0269089	.0555097
pct	-.0253309	.0251298	-1.01	0.313	-.0745952	.0239335
bill_prot	.0389569	.0362987	1.07	0.283	-.0322031	.110117
purch_tech	-.0428179	.0325693	-1.31	0.189	-.1066666	.0210308
notify_share	.0358553	.0176789	2.03	0.043	.0011976	.0705131
full_educ	-.0573548	.0454836	-1.26	0.207	-.1465209	.0318113
SFSH	1.376519	.4017481	3.43	0.001	.5889319	2.164105
MFNS	-.4131326	.0123359	-33.49	0.000	-.4373159	-.3889493
MFSH	.436988	.0726296	6.02	0.000	.2946051	.5793709
_cons	.8443688	.0344689	24.50	0.000	.7767959	.9119417

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 14,  5456) =    3.40
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0085
                                                       Root MSE      =    .204
```

peak_offpeak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0164651	.0113444	1.45	0.147	-.0057745	.0387046
dap	.0172623	.0119536	1.44	0.149	-.0061715	.040696
ptr	.0226076	.0118515	1.91	0.056	-.0006261	.0458412
tou	-.0179753	.0122938	-1.46	0.144	-.0420761	.0061255
bihd	.0065925	.0078237	0.84	0.399	-.008745	.0219301
aihd	.0111378	.0086779	1.28	0.199	-.0058744	.02815
pct	.0000295	.0107278	0.00	0.998	-.0210013	.0210603
bill_prot	.0059005	.0125902	0.47	0.639	-.0187813	.0305822
purch_tech	-.0058539	.0130905	-0.45	0.655	-.0315166	.0198088
notify_share	-.0237302	.0079234	-2.99	0.003	-.0392633	-.0081971
full_educ	.0397501	.0194957	2.04	0.042	.0015307	.0779696
SFSH	.0554211	.0420964	1.32	0.188	-.0271047	.1379469
MFNS	-.001269	.0067328	-0.19	0.851	-.0144681	.01193
MFSH	-.015802	.0248104	-0.64	0.524	-.0644403	.0328363
_cons	.9042373	.0150885	59.93	0.000	.8746577	.9338168

Table A-23 Impact of Multiple Notification Methods on Usage

Table A-23 contains results for seven models detailed below. These models differ from those in Tables A-2 through A-4 in that they include the notify_share independent variable from Table A-22 in addition to a variable that indicates whether the customer chose to be notified of events by more than one method (methods). Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed above. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 15,  5762) =  123.22
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1939
                                                       Root MSE      =  .67597
```

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0398672	.0332719	1.20	0.231	-.0253581	.1050926
dap	.0618887	.0359219	1.72	0.085	-.0085317	.1323091
ptr	.0597329	.0368834	1.62	0.105	-.0125725	.1320383
tou	.0681231	.03723	1.83	0.067	-.0048617	.1411078
bihd	-.0100429	.0241741	-0.42	0.678	-.0574333	.0373475
aihd	.0331681	.027519	1.21	0.228	-.0207795	.0871158
pct	.0135896	.0346278	0.39	0.695	-.0542938	.0814731
bill_prot	.0198045	.0410885	0.48	0.630	-.0607444	.1003535
purch_tech	-.0551985	.0435241	-1.27	0.205	-.1405222	.0301252
notify_share	.1114249	.023914	4.66	0.000	.0645446	.1583053
methods	.0098725	.0229752	0.43	0.667	-.0351675	.0549125
full_educ	-.1603851	.0589925	-2.72	0.007	-.2760326	-.0447375
SFSH	.045535	.1618347	0.28	0.778	-.2717218	.3627918
MFNS	-.6793929	.0162874	-41.71	0.000	-.7113223	-.6474634
MFSH	-.6869262	.0379428	-18.10	0.000	-.7613084	-.6125441
_cons	1.376048	.0471216	29.20	0.000	1.283672	1.468424

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 15,  5762) =  131.50
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1979
                                                       Root MSE      =  .85111

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0542689    .041085     1.32   0.187    -.0262732     .134811
         dap |   .0994697   .0450826     2.21   0.027     .0110909    .1878485
         ptr |   .0811419   .0461441     1.76   0.079    -.0093178    .1716016
         tou |   .0624692   .0459489     1.36   0.174    -.0276079    .1525462
        bihd |   .0008249   .0304557     0.03   0.978    -.0588798    .0605295
        aihd |   .0542973   .0348412     1.56   0.119    -.0140045     .122599
         pct |  -.0006122   .0414108    -0.01   0.988     -.081793    .0805686
   bill_prot |   .0351735   .0516782     0.68   0.496    -.0661352    .1364823
  purch_tech |  -.0570932   .0551848    -1.03   0.301    -.1652761    .0510897
notify_share |   .1430397   .0299249     4.78   0.000     .0843756    .2017039
     methods |  -.0013482   .0285053    -0.05   0.962    -.0572293     .054533
   full_educ |  -.2118801   .0731904    -2.89   0.004    -.3553608   -.0683994
        SFSH |   .0633689   .2125825     0.30   0.766    -.3533728    .4801106
        MFNS |  -.8675681    .020041   -43.29   0.000     -.906856   -.8282801
        MFSH |  -.8359352   .0465161   -17.97   0.000    -.9271242   -.7447462
       _cons |   1.562313   .0589246    26.51   0.000     1.446799    1.677828
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 15,  5762) =  134.49
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2021
                                                       Root MSE      =  1.1904

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   -.003256   .0577497    -0.06   0.955    -.1164672    .1099551
         dap |   .0999644   .0633763     1.58   0.115    -.0242769    .2242057
         ptr |   .0792381    .064312     1.23   0.218    -.0468375    .2053137
         tou |     .07139   .0650931     1.10   0.273    -.0562169    .1989969
        bihd |   .0112664   .0421937     0.27   0.789     -.071449    .0939818
        aihd |   .0787034   .0484228     1.63   0.104    -.0162234    .1736302
         pct |   .0094481   .0580524     0.16   0.871    -.1043564    .1232526
   bill_prot |   .0685713   .0729313     0.94   0.347    -.0744014     .211544
  purch_tech |  -.0839545   .0755885    -1.11   0.267    -.2321363    .0642273
```

```
notify_share |   .2120163   .0416677     5.09   0.000     .1303319    .2937008
     methods |  -.0260274   .0396105    -0.66   0.511    -.1036788     .051624
   full_educ |  -.3727612   .1091546    -3.41   0.001    -.5867453   -.1587771
        SFSH |  -.1157721   .2622055    -0.44   0.659    -.6297933    .3982491
        MFNS |  -1.228086    .027986   -43.88   0.000     -1.28295   -1.173223
        MFSH |  -1.187054   .0677915   -17.51   0.000    -1.319951   -1.054157
       _cons |     2.2299   .0912056    24.45   0.000     2.051103    2.408698
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 15,  5762) =   27.07
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0631
                                                       Root MSE      =    .289

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0026807   .0139067     0.19   0.847    -.0245816    .0299431
         dap |   .0367354   .0156007     2.35   0.019     .0061522    .0673186
         ptr |   .0067416   .0149853     0.45   0.653    -.0226352    .0361183
         tou |  -.0159604   .0153865    -1.04   0.300    -.0461238    .0142029
        bihd |   .0120492    .010631     1.13   0.257    -.0087916      .03289
        aihd |   .0180084    .011681     1.54   0.123    -.0048906    .0409075
         pct |   .0028209   .0145559     0.19   0.846    -.0257142     .031356
   bill_prot |    .029677   .0178636     1.66   0.097    -.0053424    .0646964
  purch_tech |   .0004852   .0183717     0.03   0.979    -.0355302    .0365005
notify_share |   .0117871    .010586     1.11   0.266    -.0089654    .0325396
     methods |  -.0077099   .0094147    -0.82   0.413    -.0261662    .0107463
   full_educ |  -.0165933   .0272913    -0.61   0.543    -.0700945    .0369079
        SFSH |    .030801   .0696304     0.44   0.658    -.1057007    .1673028
        MFNS |  -.1525476   .0079598   -19.16   0.000    -.1681517   -.1369435
        MFSH |  -.0572262   .0353396    -1.62   0.105    -.1265051    .0120527
       _cons |   1.118542   .0223398    50.07   0.000     1.074748    1.162337
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 15,  5455) =   92.72
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1741
```

Root MSE = .51354

usage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0341972	.0274418	1.25	0.213	-.0195997	.0879941
dap	.0223054	.02947	0.76	0.449	-.0354675	.0800784
ptr	.0346657	.0288793	1.20	0.230	-.0219492	.0912807
tou	.0234106	.0303421	0.77	0.440	-.036072	.0828932
bihd	.0015982	.019063	0.08	0.933	-.0357728	.0389693
aihd	.0127856	.0211841	0.60	0.546	-.0287437	.054315
pct	-.0157087	.026188	-0.60	0.549	-.0670476	.0356303
bill_prot	.0404812	.0365156	1.11	0.268	-.031104	.1120664
purch_tech	-.0466182	.0328877	-1.42	0.156	-.1110911	.0178548
notify_share	.0461247	.0183079	2.52	0.012	.0102338	.0820156
methods	.020328	.017949	1.13	0.257	-.0148593	.0555153
full_educ	-.0839538	.0467156	-1.80	0.072	-.1755351	.0076274
SFSH	1.395781	.411202	3.39	0.001	.5896608	2.201901
MFNS	-.4391754	.0126238	-34.79	0.000	-.4639231	-.4144277
MFSH	.4958826	.0710538	6.98	0.000	.3565888	.6351764
_cons	.9335006	.0355108	26.29	0.000	.8638853	1.003116

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

Linear regression

Number of obs = 5471
F(15, 5455) = 84.60
Prob > F = 0.0000
R-squared = 0.1622
Root MSE = .50247

peak	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cpp	.0517038	.0264374	1.96	0.051	-.0001241	.1035318
dap	.0346977	.028321	1.23	0.221	-.0208228	.0902181
ptr	.0501486	.0277405	1.81	0.071	-.0042339	.1045311
tou	.016153	.0291126	0.55	0.579	-.0409194	.0732254
bihd	.0032927	.0187774	0.18	0.861	-.0335184	.0401038
aihd	.0148573	.0210297	0.71	0.480	-.0263692	.0560839
pct	-.025115	.025141	-1.00	0.318	-.0744014	.0241715
bill_prot	.0388282	.0362898	1.07	0.285	-.0323143	.1099707
purch_tech	-.041854	.0325507	-1.29	0.199	-.1056663	.0219583
notify_share	.0324517	.017853	1.82	0.069	-.0025473	.0674507
methods	.0174217	.0176405	0.99	0.323	-.0171607	.0520041
full_educ	-.0582906	.0454356	-1.28	0.200	-.1473624	.0307812
SFSH	1.378018	.4024089	3.42	0.001	.5891357	2.1669

```
        MFNS |  -.4129112   .0123408   -33.46   0.000    -.4371041   -.3887183
        MFSH |   .4366523   .0726284     6.01   0.000     .2942716    .5790329
       _cons |   .8443231   .0344723    24.49   0.000     .7767436    .9119027
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 15,  5455) =    3.19
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0086
                                                       Root MSE      =  .20401

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0167116   .0113376     1.47   0.141    -.0055147    .0389379
         dap |   .0173107    .011948     1.45   0.147    -.0061122    .0407336
         ptr |   .0226038   .0118469     1.91   0.056    -.0006209    .0458285
         tou |  -.0177943    .012279    -1.45   0.147    -.0418661    .0062775
        bihd |   .0066964   .0078212     0.86   0.392    -.0086362     .022029
        aihd |   .0109651   .0086808     1.26   0.207    -.0060528     .027983
         pct |  -.0000375   .0107296    -0.00   0.997    -.0210718    .0209968
   bill_prot |   .0059404   .0125907     0.47   0.637    -.0187424    .0306231
  purch_tech |  -.0061528   .0130844    -0.47   0.638    -.0318035    .0194978
notify_share |  -.0226746   .0079742    -2.84   0.004    -.0383072   -.0070421
     methods |  -.0054028   .0066193    -0.82   0.414    -.0183792    .0075736
   full_educ |   .0400403   .0195067     2.05   0.040     .0017994    .0782812
        SFSH |   .0549562   .0418653     1.31   0.189    -.0271165    .1370288
        MFNS |  -.0013377   .0067302    -0.20   0.842    -.0145315    .0118561
        MFSH |  -.0156978   .0248264    -0.63   0.527    -.0643674    .0329717
       _cons |   .9042514   .0150899    59.92   0.000     .8746691    .9338337
------------------------------------------------------------------------------
```

Table A-24 Impact of Customer Contacts on Usage

Table A-24 contains results for seven models detailed below. These models differ from those in Tables A-2 through A-4 in that they include a dependent variable indicating whether or not customers contacted the customer support center (anycontact). Each model contains one observation per customer; and customers are excluded if they are in treatment cells F1 or F2, are in any of the IBR treatment cells, or are screened due to data problems discussed in the report. The control group consists of customers in treatment cell F3 residing in single-family homes with non-space heating.

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,  5763) =  131.32
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1917
                                                       Root MSE      =  .67686

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0387516   .0332965     1.16   0.245    -.0265219    .1040252
         dap |   .0601344   .0359892     1.67   0.095    -.0104179    .1306867
         ptr |   .0581539   .0369303     1.57   0.115    -.0142434    .1305512
         tou |   .0638849   .0373047     1.71   0.087    -.0092464    .1370162
        bihd |  -.0240516   .0254022    -0.95   0.344    -.0738494    .0257463
        aihd |    .027322   .0278582     0.98   0.327    -.0272905    .0819344
         pct |   .0046347   .0347493     0.13   0.894     -.063487    .0727563
   bill_prot |   .0239177   .0413127     0.58   0.563    -.0570708    .1049062
  purch_tech |  -.0419865   .0438931    -0.96   0.339    -.1280335    .0440605
  anycontact |   .0531343   .0221866     2.39   0.017     .0096402    .0966284
   full_educ |  -.0754743    .057018    -1.32   0.186    -.1872509    .0363024
        SFSH |   .0592033   .1639556     0.36   0.718    -.2622112    .3806178
        MFNS |  -.6789802   .0163671   -41.48   0.000    -.7110659   -.6468945
        MFSH |  -.6975296   .0379545   -18.38   0.000    -.7719347   -.6231245
       _cons |   1.373546   .0472063    29.10   0.000     1.281004    1.466088
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,  5763) =  139.38
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1952
                                                       Root MSE      =  .85246

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0542862   .0411342     1.32   0.187    -.0263523    .1349248
         dap |   .0982854   .0451529     2.18   0.030     .0097688     .186802
         ptr |   .0800944   .0462172     1.73   0.083    -.0105086    .1706973
         tou |   .0586922   .0460689     1.27   0.203    -.0316203    .1490046
        bihd |  -.0098118   .0319039    -0.31   0.758    -.0723555    .0527319
        aihd |   .0513421   .0351587     1.46   0.144    -.0175822    .1202664
```

```
         pct |  -.0075814   .0414047    -0.18   0.855    -.0887502    .0735873
   bill_prot |   .0405834   .0519011     0.78   0.434    -.0611622     .142329
  purch_tech |  -.0450697   .0556693    -0.81   0.418    -.1542024     .064063
  anycontact |   .0445941   .0282081     1.58   0.114    -.0107044    .0998926
   full_educ |  -.1062468   .0708324    -1.50   0.134    -.2451049    .0326113
        SFSH |   .0817679   .2148069     0.38   0.703    -.3393343      .50287
        MFNS |  -.8680991   .0201025   -43.18   0.000    -.9075077   -.8286906
        MFSH |  -.8483749   .0466465   -18.19   0.000    -.9398196   -.7569302
       _cons |   1.560582   .0590151    26.44   0.000      1.44489    1.676274
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is event_peak.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,  5763) =  142.62
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1993
                                                       Root MSE      =  1.1925

------------------------------------------------------------------------------
             |               Robust
  event_peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |  -.0050678   .0577988    -0.09   0.930    -.1183753    .1082396
         dap |   .0974537   .0634233     1.54   0.124    -.0268798    .2217872
         ptr |   .0773656   .0644161     1.20   0.230    -.0489142    .2036454
         tou |   .0645471   .0651482     0.99   0.322    -.0631678     .192262
        bihd |  -.0066329   .0441416    -0.15   0.881    -.0931671    .0799013
        aihd |   .0741063   .0488377     1.52   0.129    -.0216339    .1698466
         pct |  -.0014208   .0581337    -0.02   0.981    -.1153848    .1125431
   bill_prot |   .0764973   .0732122     1.04   0.296    -.0670261    .2200206
  purch_tech |  -.0634589   .0761326    -0.83   0.405    -.2127074    .0857896
  anycontact |   .0707822   .0393935     1.80   0.072     -.006444    .1480083
   full_educ |  -.2207731   .1059387    -2.08   0.037    -.4284528   -.0130935
        SFSH |  -.0884746   .2656155    -0.33   0.739    -.6091809    .4322316
        MFNS |  -1.228343   .0280795   -43.75   0.000    -1.283389   -1.173296
        MFSH |  -1.205852   .0676645   -17.82   0.000      -1.3385   -1.073204
       _cons |   2.226945   .0913662    24.37   0.000     2.047833    2.406057
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Summer time period.

```
Linear regression                                      Number of obs =    5778
                                                       F( 14,  5763) =   28.93
                                                       Prob > F      =  0.0000
```

```
                                                       R-squared     =  0.0633
                                                       Root MSE      =  .28895

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0040611   .0139357     0.29   0.771    -.0232582    .0313804
         dap |   .0375714   .0156006     2.41   0.016     .0069884    .0681544
         ptr |   .0074605   .0149834     0.50   0.619    -.0219125    .0368335
         tou |  -.0148076   .0153771    -0.96   0.336    -.0449526    .0153373
        bihd |   .0171758   .0110187     1.56   0.119    -.0044249    .0387765
        aihd |    .021331   .0117431     1.82   0.069    -.0016899    .0443518
         pct |   .0058389   .0146606     0.40   0.690    -.0229015    .0345792
   bill_prot |   .0302363   .0178476     1.69   0.090    -.0047518    .0652244
  purch_tech |  -.0027286   .0184966    -0.15   0.883     -.038989    .0335317
  anycontact |  -.0153239   .0090596    -1.69   0.091    -.0330841    .0024363
   full_educ |  -.0098781    .026046    -0.38   0.705    -.0609379    .0411818
        SFSH |   .0329763   .0690933     0.48   0.633    -.1024726    .1684252
        MFNS |  -.1534888   .0079821   -19.23   0.000    -.1691367   -.1378408
        MFSH |  -.0572908   .0352634    -1.62   0.104    -.1264204    .0118388
       _cons |   1.119604   .0223242    50.15   0.000      1.07584    1.163368
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is usage and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 14,  5456) =   98.86
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1734
                                                       Root MSE      =   .5137

------------------------------------------------------------------------------
             |               Robust
       usage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0334564   .0274514     1.22   0.223    -.0203594    .0872722
         dap |   .0213886   .0295069     0.72   0.469    -.0364568    .0792339
         ptr |   .0336331   .0289359     1.16   0.245    -.0230928    .0903591
         tou |   .0219094   .0303983     0.72   0.471    -.0376833    .0815021
        bihd |  -.0077918   .0198338    -0.39   0.694    -.0466739    .0310903
        aihd |   .0080568   .0214833     0.38   0.708     -.034059    .0501726
         pct |  -.0217862   .0261085    -0.83   0.404    -.0729692    .0293968
   bill_prot |   .0425603   .0365407     1.16   0.244     -.029074    .1141945
  purch_tech |   -.039289   .0332742    -1.18   0.238    -.1045197    .0259417
  anycontact |   .0333139   .0170091     1.96   0.050    -.0000306    .0666585
   full_educ |  -.0451705   .0447373    -1.01   0.313    -.1328734    .0425324
        SFSH |   1.395082   .4100194     3.40   0.001     .5912802    2.198884
        MFNS |  -.4390332   .0126752   -34.64   0.000    -.4638817   -.4141847
```

```
        MFSH |   .4916388    .070805     6.94   0.000     .3528328    .6304447
       _cons |   .9317448   .0356207    26.16   0.000     .8619139    1.001576
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 14,  5456) =   90.60
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1620
                                                       Root MSE      =  .50248

------------------------------------------------------------------------------
             |               Robust
        peak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   .0506068   .0263947     1.92   0.055    -.0011374     .102351
         dap |   .0336135   .0283187     1.19   0.235    -.0219025    .0891295
         ptr |   .0491325   .0277693     1.77   0.077    -.0053063    .1035714
         tou |   .0145623   .0291387     0.50   0.617    -.0425612    .0716858
        bihd |  -.0057127   .0194917    -0.29   0.769    -.0439242    .0324989
        aihd |   .0100948   .0213019     0.47   0.636    -.0316654    .0518549
         pct |  -.0307503   .0250064    -1.23   0.219    -.0797728    .0182723
   bill_prot |   .0403315   .0363419     1.11   0.267    -.0309132    .1115761
  purch_tech |  -.0350387   .0329208    -1.06   0.287    -.0995765    .0294991
  anycontact |   .0308232   .0164776     1.87   0.061    -.0014796    .0631259
   full_educ |  -.0301632   .0433005    -0.70   0.486    -.1150494    .0547229
        SFSH |   1.376457   .4014128     3.43   0.001     .5895274    2.163386
        MFNS |   -.412496   .0123814   -33.32   0.000    -.4367684   -.3882235
        MFSH |   .4333706    .072497     5.98   0.000     .2912476    .5754936
       _cons |   .8426069   .0345588    24.38   0.000     .7748579    .9103559
------------------------------------------------------------------------------
```

- Linear regression model using robust standard errors where the dependent variable is peak_offpeak and the data are limited to the Non-Summer time period.

```
Linear regression                                      Number of obs =    5471
                                                       F( 14,  5456) =    2.83
                                                       Prob > F      =  0.0003
                                                       R-squared     =  0.0067
                                                       Root MSE      =  .20418

------------------------------------------------------------------------------
             |               Robust
peak_offpeak |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
cpp	.0152582	.0113326	1.35	0.178	-.0069582	.0374746
dap	.0164846	.0119361	1.38	0.167	-.0069149	.0398842
ptr	.0223029	.0118397	1.88	0.060	-.0009075	.0455134
tou	-.0186942	.0122656	-1.52	0.128	-.0427397	.0053513
bihd	.0045294	.0081953	0.55	0.581	-.0115366	.0205955
aihd	.0093891	.008799	1.07	0.286	-.0078604	.0266387
pct	-.0007877	.0108192	-0.07	0.942	-.0219976	.0204223
bill_prot	.0049695	.0125934	0.39	0.693	-.0197187	.0296576
purch_tech	-.0049117	.0132352	-0.37	0.711	-.030858	.0210346
anycontact	.004193	.0067181	0.62	0.533	-.0089772	.0173631
full_educ	.0225103	.0184658	1.22	0.223	-.01369	.0587106
SFSH	.0525949	.0426264	1.23	0.217	-.0309697	.1361596
MFNS	-.0004571	.0067509	-0.07	0.946	-.0136916	.0127775
MFSH	-.0144634	.0247919	-0.58	0.560	-.0630654	.0341385
_cons	.9037575	.0151022	59.84	0.000	.8741512	.9333638

Table A-25 Impact of Rate on Number of Customer Contacts

Table A-25 contains the results of a Poisson regression model using robust standard errors where the dependent variable is contacts. There is one observation per customer; and customers are excluded if they are in treatment cells F1 or F2. The control group consists of customers on the CPP rate with eWeb technology (treatment cell D1a) residing in single-family homes with non-space heating.

```
Poisson regression                                Number of obs   =       7847
                                                  Wald chi2(14)   =     535.81
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -7528.6698                 Pseudo R2       =     0.0806
```

contacts	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
flr	-.6146415	.1141735	-5.38	0.000	-.8384175	-.3908654
dap	-.3085539	.0802151	-3.85	0.000	-.4657726	-.1513351
ibr	-.4027108	.0986661	-4.08	0.000	-.5960927	-.2093289
ptr	-.2752258	.0883032	-3.12	0.002	-.448297	-.1021547
tou	-.0659379	.0950742	-0.69	0.488	-.2522798	.1204041
bihd	1.609719	.0930763	17.29	0.000	1.427293	1.792146
aihd	1.324614	.1081333	12.25	0.000	1.112677	1.536551
pct	1.398565	.1331393	10.50	0.000	1.137617	1.659513
bill_prot	.3317375	.1666815	1.99	0.047	.0050478	.6584272
purch_tech	-1.141726	.1811908	-6.30	0.000	-1.496853	-.7865982
full_educ	.4766048	.3163237	1.51	0.132	-.1433784	1.096588
SFSH	.1884158	.4768452	0.40	0.693	-.7461837	1.123015
MFNS	-.3402878	.0635507	-5.35	0.000	-.4648448	-.2157307
MFSH	.3906217	.1769828	2.21	0.027	.0437417	.7375016

_cons	-2.154526	.3124096	-6.90	0.000	-2.766837	-1.542214

Table A-26 Impact of Rate and Technology on Call Duration

Table A-26 contains the results of a linear regression model where the dependent variable is call duration. There is one observation per incoming call placed to the customer support center; and calls were excluded if they were placed by customers in treatment cells F1 or F2. The control group consists of customers on the CPP rate with eWeb technology (treatment cell D1a) residing in single-family homes with non-space heating.

```
Linear regression                                      Number of obs =    2874
                                                       F( 15,  2858) =    9.93
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0102
                                                       Root MSE      =  278.17
```

callduration	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
flr	-22.44688	23.19279	-0.97	0.333	-67.92317	23.02942
dap	-35.46943	15.91806	-2.23	0.026	-66.68146	-4.257395
ibr	-46.27718	18.36892	-2.52	0.012	-82.29484	-10.25951
ptr	-26.94081	16.40802	-1.64	0.101	-59.11357	5.231947
tou	-31.82633	17.05564	-1.87	0.062	-65.26893	1.616271
bihd	46.7352	22.78011	2.05	0.040	2.06808	91.40232
aihd	31.44103	24.67414	1.27	0.203	-16.9399	79.82195
pct	25.62387	28.21284	0.91	0.364	-29.6957	80.94344
bill_prot	-6.285522	39.06721	-0.16	0.872	-82.88829	70.31724
purch_tech	-58.71107	27.02647	-2.17	0.030	-111.7044	-5.71771
full_educ	130.3792	33.08207	3.94	0.000	65.5121	195.2464
SFSH	62.73266	81.17797	0.77	0.440	-96.44065	221.906
MFNS	.8469973	11.58737	0.07	0.942	-21.87345	23.56745
MFSH	26.15116	28.51186	0.92	0.359	-29.75472	82.05705
event	-60.9816	22.07282	-2.76	0.006	-104.2619	-17.70133
_cons	179.1135	27.26676	6.57	0.000	125.649	232.578

Table A-27 Impact of Technology on Number of Customer Contacts

Table A-27 contains the results of a Poisson regression model using robust standard errors where the dependent variable is contacts. There is one observation per customer, and customers are excluded if they are in treatment cells F1 or F2 or if they are in an eWeb treatment cell. The control group consists of customers in treatment cell F6 residing in single-family homes with non-space heating.

```
Poisson regression                                Number of obs   =       5532
                                                  Wald chi2(11)   =     135.20
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -6501.3397                 Pseudo R2       =     0.0286
------------------------------------------------------------------------------
             |               Robust
    contacts |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |    .562569   .1202134     4.68   0.000      .326955    .7981829
         dap |   .2657675   .1234755     2.15   0.031       .02376     .507775
         ibr |   .1754584    .136015     1.29   0.197     -.091126    .4420429
         ptr |   .2932266   .1300577     2.25   0.024     .0383182    .5481351
         tou |   .5157242   .1320476     3.91   0.000     .2569155    .7745328
        eweb |  (omitted)
        aihd |   -.284012   .0766225    -3.71   0.000    -.4341893   -.1338346
         pct |  -.1995675   .1108458    -1.80   0.072    -.4168213    .0176863
   bill_prot |  (omitted)
  purch_tech |  -1.148136    .182368    -6.30   0.000    -1.505571   -.7907015
   full_educ |  (omitted)
        SFSH |   .2524783   .4759737     0.53   0.596    -.6804131     1.18537
        MFNS |  -.3374354   .0684817    -4.93   0.000    -.4716571   -.2032136
        MFSH |   .4084702   .1945964     2.10   0.036     .0270683    .7898721
       _cons |  -.6452792   .1095803    -5.89   0.000    -.8600526   -.4305058
------------------------------------------------------------------------------
```

Table A-28 Impact of Rate and Technology on Call Duration

Table A-28 contains the results of a linear regression model where the dependent variable is call duration. There is one observation per incoming call placed to the customer support center; and calls were excluded if they were placed by customers in treatment cells F1 or F2 or in an eWeb treatment cell. The control group consists of customers in treatment cell F6 residing in single-family homes with non-space heating.

```
Linear regression                                      Number of obs =    2664
                                                       F( 12,  2651) =    1.75
                                                       Prob > F      =  0.0508
                                                       R-squared     =  0.0061
                                                       Root MSE      =  280.03
------------------------------------------------------------------------------
             |               Robust
callduration |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpp |   18.18945   24.00251     0.76   0.449    -28.87609      65.255
         dap |  -12.09055   24.75827    -0.49   0.625    -60.63803    36.45693
```

ibr	-18.85751	26.40513	-0.71	0.475	-70.63425	32.91923
ptr	-4.246434	25.30656	-0.17	0.867	-53.86904	45.37617
tou	-8.582239	25.31084	-0.34	0.735	-58.21323	41.04875
eweb	(omitted)					
aihd	-14.83367	13.18014	-1.13	0.260	-40.67806	11.01072
pct	-18.09394	19.3568	-0.93	0.350	-56.0499	19.86202
bill_prot	(omitted)					
purch_tech	-60.76823	27.20881	-2.23	0.026	-114.1209	-7.415579
full_educ	(omitted)					
SFSH	64.58653	81.12825	0.80	0.426	-94.49455	223.6676
MFNS	1.644604	12.1991	0.13	0.893	-22.27612	25.56533
MFSH	30.34922	30.39914	1.00	0.318	-29.25922	89.95767
event	-52.95999	25.77259	-2.05	0.040	-103.4964	-2.423576
_cons	333.3006	22.09306	15.09	0.000	289.9792	376.622

Table A-29 Impact of Rate and Technology on Customer Satisfaction with Customer Support Center

Table A-29 contains the results of a linear regression model where the dependent variable is cc_satisfa~n. There is one observation per customer, and customers are excluded if they did not answer questions 19b on the CAP final survey. The control group consists of customers with the IBR rate treatment and eWeb technology (i.e., treatment cell E1) residing in single-family homes with non-space heating.

```
Linear regression                                      Number of obs =     478
                                                       F( 14,   463) =    1.98
                                                       Prob > F      =  0.0177
                                                       R-squared     =  0.0561
                                                       Root MSE      =  3.5217
```

cc_satisfa~n	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
flr	.2662389	.8973768	0.30	0.767	-1.497197	2.029675
cpp	.7463843	.8100099	0.92	0.357	-.8453668	2.338135
dap	.9784295	.8418868	1.16	0.246	-.675963	2.632822
ptr	.95259	.8758812	1.09	0.277	-.7686048	2.673785
tou	.0318734	.8636136	0.04	0.971	-1.665214	1.728961
bihd	.9823568	.4348185	2.26	0.024	.1278947	1.836819
aihd	1.358747	.5006381	2.71	0.007	.3749426	2.342551
pct	1.787829	.7028211	2.54	0.011	.4067151	3.168944
bill_prot	-.5295303	.7650654	-0.69	0.489	-2.032961	.9739005
purch_tech	-.3744645	.8005962	-0.47	0.640	-1.947717	1.198788
full_educ	-.0813874	.8961324	-0.09	0.928	-1.842378	1.679603

```
        SFSH |   2.098714   1.756329     1.19   0.233    -1.352649    5.550078
        MFNS |   -.258161   .3656959    -0.71   0.481    -.9767903    .4604682
        MFSH |  -1.083385   .7544003    -1.44   0.152    -2.565858    .3990872
       _cons |   3.446087   1.150336     3.00   0.003      1.18556    5.706614
------------------------------------------------------------------------------
```

Appendix C: Responses to Final Survey

As was discussed in Section 6 of the Phase 2 report, two surveys were conducted over the course of the CAP. The first survey, distributed in March 2010 (during the enrollment process), contained questions related to customer attitudes towards energy conservation, usage behaviors, and customer demographics. A second (final) survey was conducted from late April through mid-July 2011, as customers were returned to the standard ComEd tariff. The latter survey included 50 questions covering topics addressed in the initial survey as well as questions regarding various elements of the CAP.

This appendix contains the text of each question in the CAP final survey and tables showing the distribution of responses to each question. The responses for questions 25 through 35 are related to customer demographics and housing characteristics. These questions were asked on both the initial and the final survey, and, as such, the corresponding tables present the combined responses from both surveys.

1. For the following statements, rate your level of agreement or disagreement by selecting the appropriate number:

Question:		Strongly Disagree										Strongly Agree	Blank	Total
		0	1	2	3	4	5	6	7	8	9	10		
Conserving electricity helps the environment.	#	12	9	6	18	16	87	49	104	217	304	1575	26	2423
	%	0.5	0.4	0.2	0.7	0.7	3.6	2.0	4.3	9.0	12.5	65.0	1.1	100
I always shop for the lowest prices, even if it takes more time.	#	13	19	36	72	82	283	194	309	428	315	652	20	2423
	%	0.5	0.8	1.5	3.0	3.4	11.7	8.0	12.8	17.7	13.0	26.9	0.8	100
I am too busy to be concerned about conserving electricity in my home.	#	543	496	352	297	152	172	91	94	77	61	58	30	2423
	%	22.4	20.5	14.5	12.3	6.3	7.1	3.8	3.9	3.2	2.5	2.4	1.2	100
I think smart meters are a good thing.	#	53	39	38	55	65	483	174	222	330	305	590	69	2423
	%	2.2	1.6	1.6	2.3	2.7	19.9	7.2	9.2	13.6	12.6	24.3	2.8	100
I am very concerned about the environment.	#	13	19	21	33	28	149	105	226	404	403	998	24	2423
	%	0.5	0.8	0.9	1.4	1.2	6.1	4.3	9.3	16.7	16.6	41.2	1.0	100
Conserving electricity in my home helps me save money.	#	15	29	13	14	20	82	65	108	268	407	1378	24	2423
	%	0.6	1.2	0.5	0.6	0.8	3.4	2.7	4.5	11.1	16.8	56.9	1.0	100
I've already done everything I can to conserve electricity in my home.	#	31	40	75	115	131	352	242	348	407	233	417	32	2423
	%	1.3	1.7	3.1	4.7	5.4	14.5	10.0	14.4	16.8	9.6	17.2	1.3	100
I am usually one of the first to try new products and services.	#	73	108	172	228	186	481	280	274	245	153	202	21	2423
	%	3.0	4.5	7.1	9.4	7.7	19.9	11.6	11.3	10.1	6.3	8.3	0.9	100
I look for products that are good for the environment.	#	17	21	28	57	72	328	248	364	456	329	481	22	2423
	%	0.7	0.9	1.2	2.4	3.0	13.5	10.2	15.0	18.8	13.6	19.9	0.9	100
Energy efficiency products are too expensive.	#	95	101	149	161	169	407	290	298	306	177	243	27	2423
	%	3.9	4.2	6.1	6.6	7.0	16.8	12.0	12.3	12.6	7.3	10.0	1.1	100
Saving energy means being uncomfortable or giving up things I enjoy.	#	276	295	293	291	197	325	204	166	160	73	121	22	2423
	%	11.4	12.2	12.1	12.0	8.1	13.4	8.4	6.9	6.6	3.0	5.0	0.9	100
I like to purchase the most up-to-date appliances or electronic devices with the newest features.	#	87	150	195	237	189	473	219	233	217	167	238	18	2423
	%	3.6	6.2	8.0	9.8	7.8	19.5	9.0	9.6	9.0	6.9	9.8	0.7	100

2. Please indicate whether you agree or disagree with each statement below about the electricity pricing plan you started in May, 2010. If you are not sure, select "Don't Know.":

Question:		Agree	Disagree	Don't Know	Blank	Total
I was previously aware that a new pricing plan went into effect May, 2010.	#	1253	433	724	13	2423
	%	51.7	17.9	29.9	0.5	100
The price I pay for electricity (per kWh) is the same all day, every day.	#	244	1323	840	16	2423
	%	10.1	54.6	34.7	0.7	100
The price I pay for electricity (per kWh) changes based upon the total amount of electricity I use per month.	#	1177	434	788	24	2423
	%	48.6	17.9	32.5	1.0	100
The price I pay for electricity (per kWh) changes based upon the time of day.	#	1484	221	703	15	2423
	%	61.2	9.1	29.0	0.6	100
On certain days and times during the summer, the price I pay for electricity can increase significantly.	#	1837	146	421	19	2423
	%	75.8	6.0	17.4	0.8	100
On certain days and times during the summer, I can earn a rebate (credit applied to my bill) if I reduce my usage.	#	577	276	1548	22	2423
	%	23.8	11.4	63.9	0.9	100
During the summer, ComEd asks customers to reduce electricity usage between 1 p.m. and 5 p.m.	#	1706	115	585	17	2423
	%	70.4	4.7	24.1	0.7	100
During the summer, ComEd asks customers to reduce electricity usage between 5 p.m. and 9 p.m.	#	457	839	1106	21	2423
	%	18.9	34.6	45.6	0.9	100
My pricing plan includes a rate guarantee.	#	247	515	1644	17	2423
	%	10.2	21.3	67.8	0.7	100

3. For the following items, please rate your agreement or disagreement regarding the electricity pricing plan you started in May of 2010. If you are not aware that you started a new pricing plan in May, 2010, skip to question #4:

Question:		Strongly Disagree 0	1	2	3	4	5	6	7	8	9	Strongly Agree 10	Blank	Total
The pricing plan helps me reduce my electric bill.	#	100	105	75	94	87	425	168	167	194	93	203	712	2423
	%	4.1	4.3	3.1	3.9	3.6	17.5	6.9	6.9	8.0	3.8	8.4	29.4	100
The pricing plan is compatible with my lifestyle.	#	93	98	69	103	88	446	150	182	212	113	153	716	2423
	%	3.8	4.0	2.8	4.3	3.6	18.4	6.2	7.5	8.7	4.7	6.3	29.6	100
The pricing plan is easy to understand.	#	112	108	95	132	115	346	148	162	196	119	173	717	2423
	%	4.6	4.5	3.9	5.4	4.7	14.3	6.1	6.7	8.1	4.9	7.1	29.6	100
If possible, I want to remain on the pricing plan.	#	110	82	64	47	70	501	141	133	176	128	256	715	2423
	%	4.5	3.4	2.6	1.9	2.9	20.7	5.8	5.5	7.3	5.3	10.6	29.5	100
I would recommend the pricing plan to my family, friends, and neighbors.	#	110	94	73	66	83	509	141	142	155	118	237	695	2423
	%	4.5	3.9	3.0	2.7	3.4	21.0	5.8	5.9	6.4	4.9	9.8	28.7	100

4. You may have received (or were offered) a device that displays your electricity usage and cost. We are interested in your experience with the In-Home energy Display (called an "IHD"). For the following items, please indicate whether you agree or disagree with the statement. If you are not sure, select "Don't Know.":

Question:		Agree	Disagree	Don't Know	Blank	Total
I received an offer from ComEd for a free IHD.	#	771	590	953	109	2423
	%	31.8	24.3	39.3	4.5	100
I received an offer from ComEd to purchase an IHD.	#	131	1066	1084	142	2423
	%	5.4	44.0	44.7	5.9	100
I received an IHD in the mail.	#	653	956	706	108	2423
	%	27.0	39.5	29.1	4.5	100
My IHD is currently operating.	#	281	1233	761	148	2423
	%	11.6	50.9	31.4	6.1	100

5. If you have (or had) an IHD in your home, please rate your agreement or disagreement regarding the IHD. Otherwise, skip to question #7:

Question:		Strongly Disagree										Strongly Agree	Blank	Total
		0	1	2	3	4	5	6	7	8	9	10		
The IHD helps me reduce my electric bill.	#	159	85	59	61	40	126	59	57	54	51	81	1591	2423
	%	6.6	3.5	2.4	2.5	1.7	5.2	2.4	2.4	2.2	2.1	3.3	65.7	100
The IHD has little value to me.	#	132	95	62	78	64	129	46	30	52	45	105	1585	2423
	%	5.4	3.9	2.6	3.2	2.6	5.3	1.9	1.2	2.1	1.9	4.3	65.4	100
The IHD is easy to use.	#	132	71	48	50	39	144	56	50	74	70	102	1587	2423
	%	5.4	2.9	2.0	2.1	1.6	5.9	2.3	2.1	3.1	2.9	4.2	65.5	100
The IHD helps me monitor my electricity usage.	#	144	63	35	39	47	116	58	55	92	65	115	1594	2423
	%	5.9	2.6	1.4	1.6	1.9	4.8	2.4	2.3	3.8	2.7	4.7	65.8	100
The price alerts received on the IHD helped me reduce energy.	#	175	84	58	57	46	142	46	53	55	39	75	1593	2423
	%	7.2	3.5	2.4	2.4	1.9	5.9	1.9	2.2	2.3	1.6	3.1	65.7	100
The budget feature on my IHD helped me manage my energy cost.	#	196	90	62	57	45	152	53	36	51	32	61	1588	2423
	%	8.1	3.7	2.6	2.4	1.9	6.3	2.2	1.5	2.1	1.3	2.5	65.5	100
I would recommend the IHD to my family, friends, and neighbors.	#	183	84	43	50	35	148	49	39	66	43	102	1581	2423
	%	7.6	3.5	1.8	2.1	1.4	6.1	2.0	1.6	2.7	1.8	4.2	65.2	100

6. How often did you look at the information the IHD display?

Question:		About once a month	About once a week	At Least Once Each Day	More Than Once A Week But Not Daily	Never	Blank	Total
During the first month:	#	86	100	205	145	334	1553	2423
	%	3.5	4.1	8.5	6.0	13.8	64.1	100
In later months:	#	142	97	66	104	415	1599	2423
	%	5.9	4.0	2.7	4.3	17.1	66.0	100

7. ComEd may have mailed you information describing your new pricing plan, how to track your results, and suggestions on how you can save electricity and reduce your bill. For the following items, please indicate whether you agree or disagree with the statements regarding the information you may have received. If you are not sure, select "Don't Know.":

Question:		Agree	Disagree	Don't Know	Blank	Total
I received information about my pricing plan in the mail.	#	1179	291	911	42	2423
	%	48.7	12.0	37.6	1.7	100
I requested additional information to be mailed to me.	#	204	1617	548	54	2423
	%	8.4	66.7	22.6	2.2	100
I shared the information with others who live in my home.	#	654	1249	440	80	2423
	%	27.0	51.5	18.2	3.3	100

8. If you received information in the mail about the pricing plan, please rate your agreement or disagreement regarding the information you received. Otherwise, skip to question #9:

Question:		Strongly Disagree								Strongly Agree			Blank	Total
		0	1	2	3	4	5	6	7	8	9	10		
The information helps me reduce my electric bill.	#	119	69	70	58	74	268	129	132	167	110	180	1047	2423
	%	4.9	2.8	2.9	2.4	3.1	11.1	5.3	5.4	6.9	4.5	7.4	43.2	100
The information is easy to understand.	#	91	52	52	54	65	224	113	163	184	159	212	1054	2423
	%	3.8	2.1	2.1	2.2	2.7	9.2	4.7	6.7	7.6	6.6	8.7	43.5	100
The information has little value to me.	#	212	140	148	152	117	260	91	65	67	42	71	1058	2423
	%	8.7	5.8	6.1	6.3	4.8	10.7	3.8	2.7	2.8	1.7	2.9	43.7	100

9. ComEd sends monthly bills to your home. For the following items, please indicate whether you agree or disagree with the statements below regarding your monthly bill:

Question:		Strongly Disagree										Strongly Agree	Blank	Total
		0	1	2	3	4	5	6	7	8	9	10		
The information in the monthly bill helps me reduce my electric bill.	#	179	169	177	170	156	500	212	241	195	127	245	52	2423
	%	7.4	7.0	7.3	7.0	6.4	20.6	8.7	9.9	8.0	5.2	10.1	2.1	100
I changed my energy use in at least one way because of something I read in the monthly bill.	#	242	191	204	153	123	307	192	240	264	172	277	58	2423
	%	10.0	7.9	8.4	6.3	5.1	12.7	7.9	9.9	10.9	7.1	11.4	2.4	100
The information in the monthly bill has little value to me.	#	283	262	259	243	197	433	137	130	139	111	170	59	2423
	%	11.7	10.8	10.7	10.0	8.1	17.9	5.7	5.4	5.7	4.6	7.0	2.4	100
The monthly bill clearly presents the charges for the new pricing plan.	#	185	152	135	160	153	645	194	173	191	124	220	91	2423
	%	7.6	6.3	5.6	6.6	6.3	26.6	8.0	7.1	7.9	5.1	9.1	3.8	100

10. ComEd may have mailed Home Energy Reports to your home from time to time. This would have been mailed separately from your monthly bill. For the following items, please indicate whether you agree or disagree with the statement regarding the Home Energy Reports. If you are not sure, please select "Don't Know.":

Question:		Agree	Disagree	Don't Know	Blank	Total
I received one or more Home Energy Reports in the mail	#	1625	204	561	33	2423
	%	67.1	8.4	23.2	1.4	100
I shared the Home Energy Report with others who live in my home.	#	978	983	383	79	2423
	%	40.4	40.6	15.8	3.3	100

11. If you received one or more of the Home Energy Reports, please rate your agreement or disagreement with the statements below. If you did not receive the Home Energy Report, skip to question #12:

Question:		Strongly Disagree 0	1	2	3	4	5	6	7	8	9	Strongly Agree 10	Blank	Total
The Home Energy Reports help me reduce my electric bill.	#	147	128	127	123	99	299	171	175	197	134	229	594	2423
	%	6.1	5.3	5.2	5.1	4.1	12.3	7.1	7.2	8.1	5.5	9.5	24.5	100
The Home Energy Report is easy to understand.	#	70	70	60	50	86	241	158	224	299	223	341	601	2423
	%	2.9	2.9	2.5	2.1	3.5	9.9	6.5	9.2	12.3	9.2	14.1	24.8	100
The neighbor comparison in the Home Energy Report encourages me to save energy.	#	144	133	100	70	83	197	110	188	251	207	330	610	2423
	%	5.9	5.5	4.1	2.9	3.4	8.1	4.5	7.8	10.4	8.5	13.6	25.2	100
The Home Energy Reports have little value to me.	#	291	294	236	178	131	246	92	78	91	65	112	609	2423
	%	12.0	12.1	9.7	7.3	5.4	10.2	3.8	3.2	3.8	2.7	4.6	25.1	100
I changed my energy use in at least one way because of something I read in the Home Energy Report.	#	152	142	112	96	62	265	146	174	217	191	265	601	2423
	%	6.3	5.9	4.6	4.0	2.6	10.9	6.0	7.2	9.0	7.9	10.9	24.8	100

12. ComEd may have mailed Rate Comparison Reports to your home from time to time. This was a separate letter from your monthly bill that compared your new pricing plan to your old pricing plan. For the following items, please indicate whether you agree or disagree with the statement regarding the Rate Comparison Reports. If you are not sure, please select “Don’t Know.”:

Question:		Agree	Disagree	Don't Know	Blank	Total
I received one or more Rate Comparison Reports in the mail.	#	815	415	1145	48	2423
	%	33.6	17.1	47.3	2.0	100
I shared the Rate Comparison Report with others who live in my home.	#	476	1014	822	111	2423
	%	19.6	41.8	33.9	4.6	100

13. If you received the Rate Comparison Report, please rate your agreement or disagreement with the statements below. If you did not receive the Rate Comparison Report, skip to question #14:

Question:		**Strongly Disagree**										**Strongly Agree**	**Blank**	**Total**
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**		
The Rate Comparison Report is easy to understand.	#	66	53	33	45	41	196	94	105	141	109	214	1326	2423
	%	2.7	2.2	1.4	1.9	1.7	8.1	3.9	4.3	5.8	4.5	8.8	54.7	100
I changed my energy use in at least one way because of something I read in the Rate Comparison Report.	#	99	83	47	60	51	179	109	95	121	82	165	1332	2423
	%	4.1	3.4	1.9	2.5	2.1	7.4	4.5	3.9	5.0	3.4	6.8	55.0	100
The Rate Comparison Reports help me reduce my electric bill.	#	102	90	56	59	55	196	97	85	109	75	168	1331	2423
	%	4.2	3.7	2.3	2.4	2.3	8.1	4.0	3.5	4.5	3.1	6.9	54.9	100
The Rate Comparison Reports have little value to me.	#	186	163	125	93	73	172	50	51	44	43	90	1333	2423
	%	7.7	6.7	5.2	3.8	3.0	7.1	2.1	2.1	1.8	1.8	3.7	55.0	100

14. ComEd provided access to the SmartTools website, which displays on-line information regarding your energy usage. The SmartTools website is updated each day with the previous day's information. For the following items, please indicate whether you agree or disagree with each statement. If you are unsure, select "Don't Know.":

Question:		**Agree**	**Disagree**	**Don't Know**	**Blank**	**Total**
I have heard of the SmartTools website.	#	753	716	861	93	2423
	%	31.1	29.6	35.5	3.8	100
I viewed my energy usage information on the SmartTools website more than three times.	#	171	1462	686	104	2423
	%	7.1	60.3	28.3	4.3	100

15. If you accessed the SmartTools website, please rate your agreement or disagreement regarding the statements below. If you did not access the SmartTools website, please skip to question #16:

Question:		Strongly Disagree										Strongly Agree	Blank	Total
		0	1	2	3	4	5	6	7	8	9	10		
The SmartTools website helps me reduce my electric bill.	#	117	67	35	30	33	81	38	44	34	13	47	1884	2423
	%	4.8	2.8	1.4	1.2	1.4	3.3	1.6	1.8	1.4	0.5	1.9	77.8	100
The SmartTools website has little value to me.	#	119	68	57	39	39	76	35	19	27	16	43	1885	2423
	%	4.9	2.8	2.4	1.6	1.6	3.1	1.4	0.8	1.1	0.7	1.8	77.8	100
The SmartTools website is easy to use.	#	103	56	21	19	29	89	41	40	46	34	56	1889	2423
	%	4.3	2.3	0.9	0.8	1.2	3.7	1.7	1.7	1.9	1.4	2.3	78.0	100
I want to continue to have access to the SmartTools website.	#	102	57	22	22	20	89	31	30	45	36	85	1884	2423
	%	4.2	2.4	0.9	0.9	0.8	3.7	1.3	1.2	1.9	1.5	3.5	77.8	100

16. ComEd may have notified you when it needed help to conserve energy (called "Defeat the Peak"). For the following items, please indicate whether you agree or disagree with the statements below. If you are not sure, please select "Don't Know.":

Question:		Agree	Disagree	Don't Know	Blank	Total
I received phone notifications.	#	775	1002	597	49	2423
	%	32.0	41.4	24.6	2.0	100
I received e-mail notifications.	#	256	1426	667	74	2423
	%	10.6	58.9	27.5	3.1	100
I received text notifications.	#	151	1641	74	557	2423
	%	6.2	67.7	3.1	23.0	100

17. If you received price or conservation notifications, (regardless of the method of notification), please indicate your agreement or disagreement with the statements below. Otherwise please skip to question #18:

Question:		Strongly Disagree 0	1	2	3	4	5	6	7	8	9	Strongly Agree 10	Blank	Total
The notifications encouraged me to reduce electricity consumption in my home.	#	95	59	42	30	37	145	98	127	177	147	265	1201	2423
	%	3.9	2.4	1.7	1.2	1.5	6.0	4.0	5.2	7.3	6.1	10.9	49.6	100
I didn't have the time to take action when I was notified.	#	202	176	157	109	104	166	72	56	66	39	59	1217	2423
	%	8.3	7.3	6.5	4.5	4.3	6.9	3.0	2.3	2.7	1.6	2.4	50.2	100
The notifications were easy to understand.	#	73	42	28	14	26	145	91	115	202	185	297	1205	2423
	%	3.0	1.7	1.2	0.6	1.1	6.0	3.8	4.7	8.3	7.6	12.3	49.7	100
The notifications helped me reduce my electric bill.	#	121	72	68	55	65	229	96	99	129	104	180	1205	2423
	%	5.0	3.0	2.8	2.3	2.7	9.5	4.0	4.1	5.3	4.3	7.4	49.7	100
The notifications have little value to me.	#	251	188	162	97	82	176	54	56	47	37	61	1212	2423
	%	10.4	7.8	6.7	4.0	3.4	7.3	2.2	2.3	1.9	1.5	2.5	50.0	100

18. The SmartTools call center provided customers with information and assistance with the pricing plan. Please indicate whether you agree or disagree with the statements below. If you are unsure, please select "Don't Know.":

Question:		Agree	Disagree	Don't Know	Blank	Total
I contacted the SmartTools call center.	#	183	1484	689	67	2423
	%	7.6	61.2	28.4	2.8	100
A SmartTools representative contacted me.	#	133	1412	807	71	2423
	%	5.5	58.3	33.3	2.9	100

19. If you contacted the dedicated SmartTools call center (or were contacted by the call center), please rate your agreement or disagreement with the statements below regarding the SmartTools call center. Otherwise please skip to question #20:

Question:		Strongly Disagree 0	1	2	3	4	5	6	7	8	9	Strongly Agree 10	Blank	Total
The information provided by the SmartTools call center helped me reduce my electric bill.	#	112	63	29	29	31	68	32	27	21	21	61	1929	2423
	%	4.6	2.6	1.2	1.2	1.3	2.8	1.3	1.1	0.9	0.9	2.5	79.6	100
I found the SmartTools call center easy to do business with.	#	101	47	22	25	18	72	32	33	31	34	63	1945	2423
	%	4.2	1.9	0.9	1.0	0.7	3.0	1.3	1.4	1.3	1.4	2.6	80.3	100
The SmartTools call center has little value to me.	#	112	63	46	34	28	67	28	23	20	20	41	1941	2423
	%	4.6	2.6	1.9	1.4	1.2	2.8	1.2	0.9	0.8	0.8	1.7	80.1	100
My overall experience with the SmartTools call center was positive.	#	92	50	20	20	20	73	36	25	37	37	72	1941	2423
	%	3.8	2.1	0.8	0.8	0.8	3.0	1.5	1.0	1.5	1.5	3.0	80.1	100

20. As a direct result of your participation in ComEd's electricity pricing program, which one tool do you think was the most helpful in letting you manage your electricity cost? (Select only one.):

	Monthly Bill	My In-Home Display	Rate Comparison Report	The Home Energy Report	The SmartTools Website	The Customer Information Mailed To You	The Dedicated SmartTools Call Center	The Pricing Notification	The Pricing Plan I Was On	None Of These	Blank	Total
#	700	183	141	373	37	155	7	44	209	478	96	2423
%	28.9	7.6	5.8	15.4	1.5	6.4	0.3	1.8	8.6	19.7	4.0	100

21. As a direct result of your participation in ComEd's electricity pricing program, what actions, if any, did you take to reduce your energy cost? (Please check all that apply.):

Question:		FALSE	TRUE	Total
Used appliances at a non-peak time	#	1462	961	2423
	%	60.3	39.7	100
Replaced light bulbs with energy efficient CFL (compact fluorescent) bulbs	#	1001	1422	2423
	%	41.3	58.7	100
Used cold water for laundry	#	1564	859	2423
	%	64.5	35.5	100
Set the thermostat to 78 degrees or higher (during summer)	#	1757	666	2423
	%	72.5	27.5	100
Turned off lights and electronics that are not in use	#	666	1757	2423
	%	27.5	72.5	100
Purchased a more efficient appliance	#	1873	550	2423
	%	77.3	22.7	100
Used timers to run appliances during non-peak times	#	2261	162	2423
	%	93.3	6.7	100
Charged re-chargeable devices during non-peak times	#	2129	294	2423
	%	87.9	12.1	100
Asked household members to use less electricity	#	1270	1153	2423
	%	52.4	47.6	100
Other. Please specify	#	2280	143	2423
	%	94.1	5.9	100
I didn't take any actions	#	2173	250	2423
	%	89.7	10.3	100

22. Thinking about your experiences with ComEd's electricity pricing plan, how satisfied are you with this pricing plan?

	Extremely Dissatisfied										Extremely Satisfied	Blank	Total
	0	1	2	3	4	5	6	7	8	9	10		
#	117	93	84	144	121	681	229	264	257	152	175	106	2423
%	4.8	3.8	3.5	5.9	5.0	28.1	9.5	10.9	10.6	6.3	7.2	4.4	100

23. Thinking about your experiences with ComEd as your electric utility, how satisfied are you with ComEd?

	Extremely Dissatisfied										Extremely Satisfied	Blank	Total
	0	1	2	3	4	5	6	7	8	9	10		
#	77	69	70	132	120	487	206	344	358	236	262	62	2423
%	3.2	2.8	2.9	5.4	5.0	20.1	8.5	14.2	14.8	9.7	10.8	2.6	100

24. If you could change ONE thing about the program what would it be and why?

Due to the open-ended nature of this question, responses are not provided in this Appendix.

25. How would you describe your home?

	Detached Single Family Home	Condominium	Apartment	Mobile Home	Townhouse, Duplex or Row House	Other	Blank	Total
#	1295	231	594	13	132	66	92	2423
%	53.4	9.5	24.5	0.5	5.4	2.7	3.8	100

26. Do you rent or own your home?

	Own (Or Buying)	Rent	Blank	Total
#	1769	564	90	2423
%	73.0	23.3	3.7	100

27. How many bedrooms are in your home? (check one):

	One Bedroom	Two Bedrooms	Three Bedrooms	Four or More Bedrooms	Blank	Total
#	266	733	891	441	92	2423
%	11.0	30.3	36.8	18.2	3.8	100

28. What is your home's primary method of cooling in the summer? (check one):

	Central Air Conditioning	Window or Wall Air Conditioning/Room Air Conditioners	Fans	Other	None	Blank	Total
#	1091	941	275	15	12	89	2423
%	45.0	38.8	11.3	0.6	0.5	3.7	100

29. Do you have internet access? (check all that apply)

This question was presented inconsistently between the initial and final surveys, therefore responses are not provided in this appendix.

30. In what year were your born?

	1990	1920 - 1929	1930 - 1939	1940 - 1949	1950 - 1959	1960 - 1969	1970 - 1979	1980 - 1989	Before 1920	Blank	Grand Total
#	1	89	214	431	567	408	338	139	18	210	2415
%	0.0	3.7	8.9	17.8	23.5	16.9	14.0	5.8	0.7	8.7	100

31. What best describes the level of schooling you have completed?

	Elementary School	Some High School	Graduated High School	Trade Or Technical School	Some College	Graduated College	Graduate Or Professional School	Blank	Total
#	74	121	394	111	448	633	520	122	2423
%	3.1	5.0	16.3	4.6	18.5	26.1	21.5	5.0	100

32. How many people, including yourself, live in your household?

	0	1	2	3	4	5	6	7	8	9	Blank	Total
#	16	552	759	376	351	159	61	23	11	1	114	2423
%	0.7	22.8	31.3	15.5	14.5	6.6	2.5	0.9	0.5	0.0	4.7	100

33. How many in your household are under the age of 18?

	0	1	2	3	4	5	6	7	Blank	Total
#	1506	320	286	91	27	12	5	2	174	2423
%	62.2	13.2	11.8	3.8	1.1	0.5	0.2	0.1	7.2	100

34. What is your racial or ethnic background? (check one):

	White, Not Of Hispanic Origin	Black, Not Of Hispanic Origin	Asian or Pacific Islander	American Indian Or Alaskan Native	Hispanic Or Latino	Other	Blank	Total
#	1315	444	53	5	378	82	146	2423
%	54.3	18.3	2.2	0.2	15.6	3.4	6.0	100

35. Which of the following best describes your 2009 household income before taxes? (check one):

	Less Than $20,000 A Year	Between $20,000 and $39,999 A Year	Between $40,000 and $79,999 A Year	Between $80,000 and $120,000 A Year	Greater Than $120,000 A Year	Blank	Total
#	431	485	668	365	270	204	2423
%	17.8	20.0	27.6	15.1	11.1	8.4	100

Appendix D: NCES Customer Demand Model

This appendix describes a version of the nested constant elasticity of substitution (NCES) demand model. The immediate application is the dynamic pricing components of Commonwealth Edison's (ComEd) Customer Applications Pilot (CAP).

Model Specification

The nested CES is derived from a cost function that allocates a customer's electricity costs separately within a day and between days. That is, overall cost is a function of *daily price indexes*, which in turn are functions of the hourly prices (or average prices for daily sub-periods) on each day. The traditional version of the model, which has typically been applied to analysis of hourly real-time pricing, allows two levels of customer flexibility to respond to changing electricity prices. One level involves the flexibility of customers to shift load between hours (or sub-periods) *within* a day; the other level allows the flexibility to shift load *between* days in response to differences in the overall average price level between different days.[74]

Certain aspects of the CAP dynamic price structures, which include critical-peak pricing (CPP), peak-time rebates (PTR), and day-ahead hourly pricing (DAP), suggest modifying the usual hourly version of the NCES model. That is, while customers assigned to all three of the above rates experience day-ahead hourly pricing, there was relatively little hour-to-hour variation in prices during the summer of 2010. Largely due to a daily revenue-neutrality condition, most price variation was between peak and off-peak hours. In addition, on event days, the CPP prices and PTR credits took on essentially the same value for each hour of the four-hour event period. These conditions suggest that for efficiency sake, the hours of the day be grouped into sub-periods for purposes of estimation.

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[74] For a technical description and application of the NCES model, see J.A. Herriges, S.M. Baladi, D.W. Caves and B.F. Neenan, "The Response of Industrial Customers to Electric Rates Based Upon Dynamic Marginal Costs," *Review of Economics and Statistics*, p. 446-454, 1993.

In the NCES model, the daily price index for day *d*, D_d, is specified via the CES functional form as a *load-weighted average of elasticity-adjusted hourly prices* P_h in that day[75]:

$$D_{\mathrm{d}} = \left(\sum_{h \in d} \alpha_{\mathrm{hd}} P_{\mathrm{h}}^{(1-\sigma_{\mathrm{w}})} \right)^{1/(1-\sigma_{\mathrm{w}})}$$

where α_{hd} is a load shape parameter that approximates the fraction of daily load in hour (or time-period) *h*, and σ_w is the *within-day elasticity of substitution* parameter. Next, the aggregate monthly price index M_m, also expressed as a CES function, is a load-weighted average of elasticity-adjusted daily prices D_d in that month:

$$M_m = \left(\sum_{d} \beta_{\mathrm{d}} D_{\mathrm{d}}^{(1-\sigma_b)} \right)^{1/(1-\sigma_b)}$$

where β_d is a second load shape parameter that approximates the fraction of aggregate monthly load that occurs in day *d*, and σ_b is the *between-day elasticity of substitution* parameter.

The customer's demand for electricity may then be obtained by differentiating the cost function implied by these price indexes with respect to the input prices. It is most convenient to specify the resulting demand equations *relative to a base, or average reference load*, and in logarithm form as shown in the following equation:

$$\ln\left(\frac{E_{dh}}{\overline{E}_h^m}\right) = \sigma_w \left[\ln\left(\frac{D_d}{\overline{D}^m}\right) - \ln\left(\frac{P_{dh}}{\overline{P}_h^m}\right) \right] + \sigma_b \left[\ln\left(\frac{M_m}{\overline{M}^m}\right) - \ln\left(\frac{D_d}{\overline{D}^m}\right) \right] \qquad (1)$$

E_{dh} represents electricity usage in hour (or time period) *h* on day *d*, P_{dh} is the price in that time period on day *d*, and the daily and monthly price indexes are as defined above. The variables with the super bars in the denominators of each term represent averages of the variable for the comparable time period in the reference period (*e.g.*, the average load in time period *h* on weekdays in a given month)[76]. The demand equations have two types of parameters. The *load shape parameters* (α_{hd} and β_d) characterize the inherent shape of the customer's load pattern. They are used to construct the daily and monthly price indexes, but are not estimated statistically. The *price response parameters* (σ_w and σ_b) characterize

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[75] In the version of the model applied here, we define the daily price index in terms of the average prices for four time periods of interest during the day: *peak*, *off-peak*, and pre- and post-peak *shoulder* periods, where peak period is defined as the four-hour CPP/PTR event window. In this case, 24 hourly observations per day are reduced to four per day.

[76] In the CAP analysis, the reference period was an average of several days of mild weather and low prices for the relevant rate treatment group.

how the load responds to changing hourly prices. Only the price response parameters are estimated.[77]

Implementation

For application to the ComEd evaluation, we define four daily *sub-periods* as follows:

1. Off-peak (hours-ending 1-10, and 23-24)
2. Morning shoulder (HE 11-13)
3. Peak (HE 14 – 17)
4. Evening shoulder (HE 18 – 22).

We define the *base period* for constructing the denominator terms as the four days that had temperatures and load profiles that suggested little or no air conditioning load – June 3, 7, 8, and 14. Base period loads and weather variables are calculated as averages by time period across those four days.

For the *price indexes* in the numerators, we use approximations that effectively assume zero elasticities of substitution in forming the weighted sums.[78] Three sets of price indexes are calculated – one for each *sub-period* of each day and month, defined above (where we re-label the hourly P_h variables in the above equations as DP_s, where s indicates sub-period); one for each *day* of each month ($D_{d,m}$), and one for each month (M_m). For the weights in the price indexes, we use load data for non-event weekdays. The relevant equations are:

> $DP_{s,d,m} = \Sigma_h\, g_{h,s}\, P_{h,s,d,m}$, where $g_{h,s}$ is the share of sub-period s's usage in hour h on the average non-holiday, non-event weekday in month m.[79]
>
> $D_{d,m} = \Sigma_s\, \alpha_s\, DP_{s,d,m}$, where α_s is the share of usage in sub-period s on the average non-holiday, non-event weekday in month m.[80]
>
> $M_m = \Sigma_d\, \beta_d\, D_{d,m}$, where β_d is the share of usage on day d in month m. We exclude weekend days, so for purposes of calculating β_d , the total usage is the sum of non-holiday weekday usage in the month.[81]

[77] As described below, the model can be made more realistic by adding weather and time-period indicator variables.

[78] We expect the elasticity values to be relatively small in any case. The more formal approach is to construct the price indexes using combinations of arithmetic and geometric averages, which produces a theoretically appropriate approximation to the "true" price index that includes the elasticity parameters.

[79] The $DP_{s,d,m}$ are calculated for each sub-period, day and month, *including* event days (i.e., calculate the $g_{h,s}$ first, using only non-event days; then calculate the price indexes).

[80] $D_{d,m}$ is calculated for each day and month, *including* event days.

[81] M_m is calculated as the weighted sum across all weekdays in the month, *including* event days.

Note that each of the sets of weights sum to 1 (*e.g.*, the weights across hours in each sub-period, across sub-periods on the average day, and across days in the month).

The estimation equation is given by (1) [except that the *h* are replaced by *s*, and P_h by DP_s], plus a set of *constant terms* and a *weather term*.

The terms in the denominators with superscript bars over the variables are calculated similarly to the price indexes above, but with prices and load weights only for the four "base" days. That is, the comparable average hourly load-weights by sub-period and average sub-period loads are calculated using data for the base days. Then $DP^{Base}{}_s$ is calculated as the average *for each sub-period* across hours and the four days (i.e., rather than one set for each day, there is only one set that averages over the four base days), and D^{Base} is calculated as the load-weighted average across sub-periods and the four base days (i.e., rather than one for each day and month, there is only one "average-day" price index that applies for all days and months). Finally, since there is only one average base-day price index, M^{Base} is equal to that value, and is the same for each month.

The constant term in the equation consists of the default regression constant, plus separate indicator variables for sub-periods 2, 3, and 4, as well as months July and August. The weather term is constructed analogously to the price index terms in (1). That is,

$$\tau_s\ (\ln(\mathrm{WtdTHI}_{s,d,m}) - \ln(\mathrm{WtdTHI}^{Base}{}_s\ )),$$

where the τ_s are parameters to be estimated, and WtdTHI_s is a weighted average of the temperature humidity index (THI) for day s and the previous two days.

The estimation equation is applied to data consisting of four sub-period observations per day for each weekday of the summer.

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