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Home Energy Report Opower Program
PY7 Evaluation Report

FINAL

Energy Efficiency/Demand Response Plan:
Plan Year 7
(6/1/2014-5/31/2015)

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E. Executive Summary

This report presents a summary of the findings and results from the impact evaluation of the PY7[1] Home Energy Report (HER) Opower program. Commonwealth Edison Company (ComEd) designed the program to generate energy savings by providing residential customers with sets of information about customer energy use and energy conservation. Program participants received information in the form of quarterly home energy reports that gave customers various types of information, including the following:

- Assessment of how their recent energy use compared to their energy use in the past
- Tips on how to reduce energy consumption, some of which were tailored to the customer's circumstances.
- Information on how their energy use compared to that of neighbors with similar homes.

Other studies have shown that this set of information induces customers to reduce their energy use, creating average energy savings in the one to three percent range.

The design of the program did not change in PY7, but the enrollment configuration did. First, ComEd added a new wave (Wave 7 in this report) with approximately 1.2 million customers in June 2014. This wave was split in half between low and high usage customers. Second, the AMI pilot group (Wave 5 AMI in this report) stopped receiving reports in August 2014.

E.1. Program Savings

Table E-1 summarizes the electricity savings from the HER program. The PY7 planning target for this program was 239,000 MWh and the savings estimated by the implementation contractor, Opower, were 216,318 MWh. Verified savings, prior to uplift were 206,938 MWh. After adjusting for uplift from other energy efficiency programs (see Section 3.2), final verified savings were 205,278 MWh. The verified realization rate was 95 percent. As explained in Section 4, a key feature of the randomized controlled trial (RCT) design is that the analysis inherently estimated net savings because there were no participants who otherwise might have received individualized reports in the absence of the program. Thus, there was no free ridership and no NTGR was applied for this program.

As part of a study of persistence, the HER program includes three groups of customers who received no reports in PY7. These three groups accounted for 6,846 MWh (3.33 percent) of savings. Without these three groups, savings in PY7 were 198,432 MWh. The savings for these three groups are evidence of the fact that savings from HER programs persist after reports are stopped.

[1] The PY7 program year began June 1, 2014 and ended May 31, 2015.

Table E-1. PY7 Total Program Electric Savings

Savings Category	Energy Savings (MWh)
Implementer Savings Estimate†	216,318
Verified Savings, Prior to Uplift Adjustment	206,938
PY7 Uplift Adjustment	928
Legacy Uplift Adjustment	733
Final Verified Savings	205,278
Final Verified Realization Rate‡	95%

Source: ComEd tracking data and Navigant analysis.

† This estimate comes from the implementation contractor's ex-post analysis of the program.

‡ The realization rate is calculated as the final verified savings divided by the implementer savings estimate.

E.2. Program Savings by Participant Wave

For the purposes of this report, Navigant characterizes the Opower portion of the HER program as having been rolled out in the following seven waves:

1. A pilot program targeting 50,000 residential customers kicked off in July 2009 (Wave 1);
2. A wave of about 3,000 customers (Wave 2) targeted for program enrollment started in September 2010 to "fill-in" for Wave 1 dropouts;
3. A major expansion targeting 200,000 customers begun in May 2011 (Wave 3);
4. Another fill-in wave of 20,000 customers started in January 2012 (Wave 4);
5. A third fill-in wave of 20,000 customers introduced in July 2012 (Wave 5 Non-AMI) and a pilot group of 60,000 AMI customers started at the same time (Wave 5 AMI); and
6. A fourth fill-in of 10,000 customers and a major expansion targeting 90,000 customers begun in June 2013 (Wave 6).
7. A "tsunami" wave of 1.2 million customers begun in June 2014; this wave was split into two groups based on usage (Wave 7 Low and Wave 7 High).

To examine the persistence of savings, reports for 10,000 customers within both Waves 1 and 3 were terminated beginning in October 2012 and restarted in August 2013; these customers are referred to as the Waves and 3 lapsed report (LR) groups. In October 2013, ComEd chose 10,000 customers each in Waves 1, 3, and 5 Non-AMI for HER termination; these customers did not receive any reports in PY7 and comprise the terminated report (TR) groups. In this report, savings are estimated for these three groups in PY7 although these customers received no reports in this program year. Navigant is planning to conduct a separate study of the decay rates and the persistence of savings in the first year after reports were stopped for the three TR groups.

The rollout of the seven waves is summarized in Table E-2. As shown in the rightmost column, daily electricity usage in PY7 varied widely across the different waves. Wave 7 Low had the lowest usage at 17 kWh per day and Wave 5 non-AMI had the highest at 61 kWh per day. It should be noted that Wave 7 High had average usage of only 27 kWh per day; although this is high compared to Wave 7 Low customers, it is still the third lowest consumption across all the waves. HER programs have a well-documented pattern that higher usage customers achieve higher savings from the program.

Table E-2. Synopsis of the HER Program

Wave	Persistence Group Indicator	Month of First Report†	Month of Last Report	Month of Restarted Report	Targeted Number of Participants‡	Targeted Number of Controls‡	Average Daily Usage in PY7 (kWh)
1	CR	July 2009	-	-	50,000	50,000	38.45
1	LR	July 2009	August 2012	August 2013	10,000	50,000	38.33
1	TR	July 2009	September 2013	-	10,000	50,000	38.52
2	-	September 2010	-	-	3,000	3,000	36.79
3	CR	May 2011	-	-	200,000	50,000	48.99
3	LR	May 2011	August 2012	August 2013	10,000	50,000	49.00
3	TR	May 2011	September 2013	-	10,000	50,000	48.99
4	-	January 2012	-	-	20,000	20,000	31.78
5 AMI	-	July 2012	-	-	60,000	30,000	19.18
5 Non-AMI	CR	July 2012	-	-	20,000	20,000	59.42
5 Non-AMI	TR	July 2012	September 2013	-	10,000	20,000	60.52
6	-	June 2013	-	-	100,000	30,000	43.11
7 Low	-	June 2014	-	-	600,000	50,000	17.00
7 High	-	June 2014	-	-	600,000	50,000	27.48

Source: Opower tracking data and Navigant analysis

†This is the month of the "RCT start date" in the Opower dataset when a wave was initiated. Participants likely received their first report approximately one month after this date.

‡These numbers are the targeted numbers for each wave. The actual number of participants and control customers at the start of PY7 is used in this evaluation.

Table E-3 summarizes estimated program savings by participant wave. In this table, the number of participants, in the first row, represents the number of customers receiving reports in each wave, while the sample size – treatment, in the second row, indicates the number of customers with sufficient data for inclusion in the regression analysis. Across all waves, there were approximately 1.7 million participants for whom savings were calculated. Navigant estimated separate savings for each wave and subgroup (for example, Wave 1 CR) using regression analysis as described in Section 2.4. The weighted average per customer savings estimate was 1.13 percent (120.56 kWh).

Total savings in PY7 were 205,278 MWh after accounting for uplift. Of this savings after accounting for uplift, 6,846 MWh came from the three TR groups who received no reports during PY7. Without these three groups, savings in PY7 were 198,432 MWh. The savings for these three groups are evidence of the fact that savings from HER programs persist after report are stopped.

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Table E-3. PY7 HER Program Results, by Wave

Type of Statistic	Wave 1 CR	Wave 1 LR	Wave 1 TR	Wave 2	Wave 3 CR	Wave 3 LR	Wave 3 TR	Wave 4	Wave 5 AMI	Wave 5 Non-AMI CR	Wave 5 Non-AMI TR	Wave 6	Wave 7 Low Usage	Wave 7 High Usage	Total
Number of Participants	28,915	8,827	8,761	2,975	179,057	9,825	9,807	20,708	62,770	9,945	9,941	104,985	629,987	629,989	1,716,492
Sample Size - Treatment	21,852	6,712	6,680	2,265	146,486	8,020	7,956	17,372	41,139	5,529	5,486	79,897	575,681	578,861	1,503,936
Sample Size - Control	33,131			2,296	40,183			17,434	20,370	7,033		24,259	48,039	48,283	241,028
Percentage Savings	2.54%	2.52%	2.28%	2.83%	2.75%	2.79%	2.46%	2.46%	1.21%	1.68%	0.89%	1.64%	0.53%	0.99%	1.13%
Standard Error	*0.25%*	*0.40%*	*0.40%*	*0.90%*	*0.15%*	*0.31%*	*0.31%*	*0.24%*	*0.26%*	*0.48%*	*0.48%*	*0.17%*	*0.09%*	*0.08%*	-
kWh Savings Per Customer	272.84	271.74	246.42	295.81	410.66	415.93	362.95	242.12	58.46	236.35	125.21	213.55	30.17	93.22	120.56
Standard Error	*26.91*	*42.66*	*43.52*	*94.01*	*21.84*	*46.86*	*45.40*	*23.67*	*12.34*	*67.19*	*67.53*	*22.47*	*5.41*	*7.55*	-
Verified Gross Savings, Prior to Uplift Adjustment, MWh†	7,889	2,399	2,159	880	73,531	4,087	3,559	5,014	3,670	2,350	1,245	22,420	19,006	58,730	206,939
Standard Error	*778*	*377*	*381*	*280*	*3910*	*460*	*445*	*490*	*775*	*668*	*671*	*2359*	*3,407*	*4,927*	-
Savings Uplift in Other EE Programs in PY7, MWh‡	10	149	142	-11	17	10	-21	8	74	9	1	19	6	515	928
Legacy Savings Uplift in Other EE Programs, MWh‡	135	4	8	-7	471	-25	3	-9	73	6	-16	89	-	-	733
Verified Gross Savings, MWh†‡	7,744	2,246	2,009	898	73,043	4,102	3,577	5,015	3,523	2,335	1,260	22,312	19,000	58,215	205,278

Source: Navigant analysis

†Total savings are pro-rated for participants that closed their accounts during PY7.

‡Negative double counted savings indicate that the participation rate in the EE program is higher for the control group than the treatment group. This lowers the baseline and underestimates HER program savings.

†‡ Gross savings adjusted for savings uplift are equal to gross savings less the uplift of savings in other EE programs.

E.3. Findings and Recommendations

The following section includes program findings and recommendations.[2] Across all waves, there were approximately 1.7 million participants for whom savings were calculated. Total verified savings for PY7 were 206,938 MWh prior to uplift and 205,321 MWh after the uplift adjustment.

Finding 1. In PY7 ComEd added Wave 7 with 1.2 million participants to the HER; this wave swamps the size of the older waves which combined have only 450,000 participants. While adding Wave 7 increased total verified savings for the program in PY7 by almost sixty percent (76,258 MWh) over PY6, the average savings per customer were 1.13 percent or 121 kWh per year in PY7; down from an average savings per customer of 1.94 percent or 289 kWh per year in PY6. The decrease in average savings per customer is mostly due to Wave 7, which has low average daily usage compared to Wave 1 through 6 and, therefore, lower average savings per customer: 0.99 percent for the high usage customers and 0.53 percent for the low usage customers. Outside of Wave 7 participants, percentage savings for Waves 1 through 6 in PY7 actually increased compared to PY6 to 2.16 percent.

Recommendation 1. With the low savings being realized by the Wave 7 customers, ComEd should adjust their future savings targets for this program. For Waves 1 through 6 average ramp up in the second year of reports has been 33 percent; if this pattern holds for Wave 7, PY8 savings would project to be 0.70 percent for Wave 7 Low and 1.32 percent for Wave 7 High. These forecasts for PY8 could be incorrect if Wave 7 follows a different pattern of ramp-up than the earlier waves.

Finding 2. Navigant reviewed older waves to identify potential opportunities for additional savings for the program. Waves 1 and 3 in particular, have higher ratios of treatment to control customers than the newer waves. Navigant did a preliminary power analysis and found that if 10,000 customers in the control group for Wave 1 were randomly selected to be placed into a new treatment wave, the new wave and each of three existing persistence subgroups in Wave 1 would have statistically significant savings estimates at the 90 percent level.

Recommendation 2. Given that high usage customers tend to save more and most of ComEd's high usage customers are already involved in the HER program, moving some of the Wave 1 and 3 customers into new treatment groups might allow ComEd to add more high usage customers as participants in the HER program. Since Navigant's preliminary power analysis showed proof of concept for moving control customers in Wave 1 to a new treatment wave without losing statistical significance, Navigant recommends that ComEd conduct a more involved power analysis to determine how many customers could be shifted from the control groups to new treatment waves for Waves 1 and 3.

[2] Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

1 Introduction

1.1 Program Description

This report presents a summary of the findings and results from the impact evaluation of the PY7[3] Home Energy Report (HER) Opower program. Commonwealth Edison Company (ComEd) designed the program to generate energy savings by providing residential customers with sets of information about customer energy use and energy conservation. Program participants received information in the form of quarterly home energy reports that gave customers various types of information, including the following:

- Assessment of how their recent energy use compared to their energy use in the past
- Tips on how to reduce energy consumption, some of which were tailored to the customer's circumstances (e.g., customers with pools received information on how to reduce energy use related to pools).
- Information on how their energy use compared to that of neighbors with similar homes.

Other studies have shown that this set of information induces customers to reduce their energy use, creating average energy savings in the one to three percent range.

An important feature of the HER program is that it was a randomized controlled trial (RCT). Customers in the feasible set of customers (that is, those customers meeting program criteria) were randomly assigned to a treatment (participant) group or control (non-participant) group for the purpose of estimating changes in energy use due to the program.

ComEd rolled out the HER program in PY7 in the following seven waves:

1. A pilot program targeting 50,000 residential customers kicked off in July 2009 (Wave 1);
2. A wave of about 3,000 customers (Wave 2) targeted for program enrollment started in September 2010 to "fill-in" for Wave 1 dropouts;
3. A major expansion targeting 200,000 customers begun in May 2011 (Wave 3);
4. Another fill-in wave of 20,000 customers started in January 2012 (Wave 4);
5. A third fill-in wave of 20,000 customers introduced in July 2012 (Wave 5 Non-AMI) and a pilot group of 60,000 AMI customers started at the same time (Wave 5 AMI); and
6. A fourth fill-in of 10,000 customers and a major expansion targeting 90,000 customers begun in June 2013 (Wave 6).
7. A "tsunami" wave of 1.2 million customers begun in June 2014; this wave was split into two groups based on usage (Wave 7 Low and Wave 7 High).

To examine the persistence of savings, reports for 10,000 customers within both Waves 1 and 3 were terminated beginning in October 2012 and restarted in August 2013; these customers are referred to as the Waves and 3 lapsed report (LR) groups. In October 2013, ComEd chose 10,000 customers each in Waves 1, 3, and 5 Non-AMI for HER termination; these customers did not receive any reports in PY7 and comprise the terminated report (TR) groups. In this report, savings are estimated for these three groups in PY7 although these customers received no reports in this program year. Navigant is planning to conduct a

[3] The PY7 program year began June 1, 2014 and ended May 31, 2015.

separate study of the decay rates and the persistence of savings in the first year after reports were stopped for the three TR groups.

The rollout of the seven waves is summarized in Table 1-1. As shown in the rightmost column, daily electricity usage varied widely across the different waves. Wave 7 Low had the lowest usage at 17 kilowatt-hours (kWh) per day and Wave 5 Non-AMI TR had the highest at 61 kWh per day. Table 1-1provides a graphical depiction of average daily usage levels by wave.

Table 1-1. Synopsis of the HER Program

Wave	Persistence Group Indicator	Month of First Report†	Month of Last Report	Month of Restarted Report	Targeted Number of Participants‡	Targeted Number of Controls‡	Average Daily Usage in PY7 (kWh)
1	CR	July 2009	-	-	50,000	50,000	38.45
1	LR	July 2009	August 2012	August 2013	10,000	50,000	38.33
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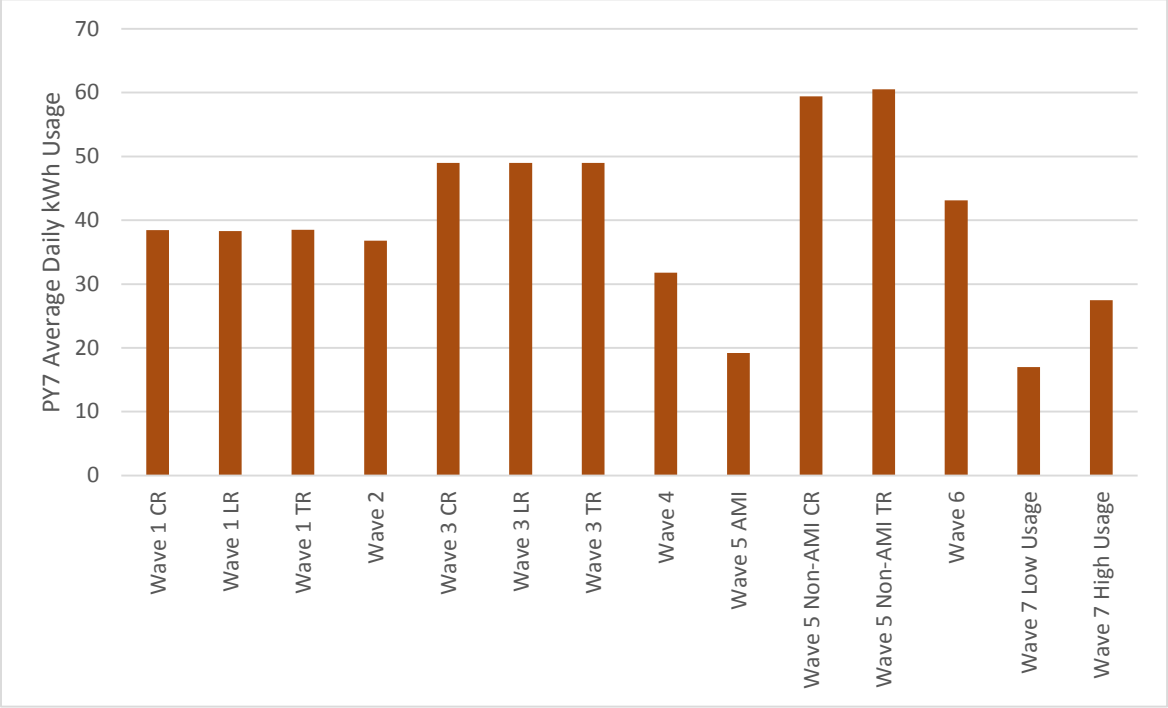
3	LR	May 2011	August 2012	August 2013	10,000	50,000	49.00
3	TR	May 2011	September 2013	-	10,000	50,000	48.99
4	-	January 2012	-	-	20,000	20,000	31.78
5 AMI	-	July 2012	-	-	60,000	30,000	19.18
5 Non-AMI	CR	July 2012	-	-	20,000	20,000	59.42
5 Non-AMI	TR	July 2012	September 2013	-	10,000	20,000	60.52
6	-	June 2013	-	-	100,000	30,000	43.11
7 Low	-	June 2014	-	-	600,000	50,000	17.00
7 High	-	June 2014	-	-	600,000	50,000	27.48

Source: Opower tracking data and Navigant analysis

†This is the month of the "RCT start date" in the Opower dataset when a wave was initiated. Participants likely received their first report approximately one month after this date.

‡These numbers are the targeted numbers for each wave. The actual number of participants and control customers at the start of PY7 is used in this evaluation.

Figure 1-1. PY7 Average Daily Usage by Wave



Source: Navigant analysis

1.2 Evaluation Objectives

The primary objective of the analysis in this report is to determine the extent to which participants in the PY7 HER program reduced their energy consumption. A secondary objective is to evaluate how program savings have changed over time.

2 Evaluation Approach

The evaluation approach in PY7 is consistent with that of the evaluations in previous years, relying on statistical analysis appropriate for RCTs. Navigant estimated program impacts using two approaches: a simple post-program regression (PPR) analysis with lagged controls and a linear fixed-effects regression (LFER) analysis applied to monthly billing data.

2.1 *Overview of Data Collection Activities*

Navigant received tracking data and monthly billing data for all program participants and control customers from September 2008 to May 2015 from the program implementer. Table 2-1 provides details.

Table 2-1. Primary Data Collection Activities

Collection Method	Subject Data	Quantity	Net Impact	Process
Billing Data	Program participants and controls	All	X	N/A
Tracking Data	Program participants and controls	All	X	N/A
Tracking Data for Other Programs	Participants in other programs	All	X	N/A

Source: Navigant analysis

2.2 *Sampling Plan*

The HER program was executed by the program implementer as a RCT, in which individuals were randomly assigned to either a treatment (participant) group or control (non-participant) group.[4] Data for all participants and controls are included in this impact evaluation.

2.3 *Data Used in Impact Analysis*

In preparation for the impact analysis, Navigant combined and cleaned the data provided by the implementer. The dataset included 1,716,492 treatment customers and 296,910 controls. Data during the twelve month pre-period for each wave and during PY7 was used in the regression analysis for each of the two models described in Section 2.4.

Navigant removed the following customers and data points from the analysis:

- Customers with an active account and less than 11 bills or any customer with more than 13 bills during PY7 (1,477 participants, 347 controls);
- Customers with less than 11 or more than 13 bills during the pre-program year (109,894 participants, 19,109 controls);
- Observations with missing or negative usage;
- Observations with less than 20 or more than 40 days in the billing cycle;

[4] In this design, treatment customers receive HERs, while control customers do not.

- Outliers, defined as observations with average daily usage more than one order of magnitude from the median usage.[5]

Detailed counts of the customers and observations removed by wave are included in Section 6.1 of the appendix.

2.4 Statistical Models Used in the Impact Evaluation

As indicated above, Navigant estimated program impacts using two approaches: a simple post-program regression (PPR) analysis with lagged controls and a linear fixed-effects regression (LFER) analysis applied to monthly billing data. Navigant uses the PPR results for reporting total program savings for PY7 but ran both models as a robustness check.[6] Although the two models are structurally very different, assuming the RCT is well balanced with respect to the drivers of energy use, in a single sample they generate very similar estimates of program savings.

The PPR model combines both cross-sectional and time-series data in a panel format. It uses the post-program data as the dependent variable, with lagged energy use from the same calendar month of the pre-program period serving as a control for any small, systematic differences between the treatment and control customers. The lagged energy use term is similar to the customer fixed effect included in the LFER model explained below.

As with the PPR model, the LFER model combines both cross-sectional and time-series data in a panel format. The regression essentially compares pre- and post-program billing data for participants and controls to identify the effect of the program. The customer-specific fixed effect is a key feature of the LFER analysis and captures all customer-specific factors affecting electricity usage that do not change over time, including those that are unobservable. Examples include the square footage of a residence or the number of occupants. The fixed effect represents an attempt to control for any small, systematic differences between the treatment and control customers that might occur due to chance.

Section 6.2 presents the PPR and LFER models used in the analysis.

2.5 Accounting for Uplift in Other Energy Efficiency Programs

2.5.1 Accounting for Uplift in PY7

The home energy reports sent to participating households included energy-saving tips, some of which encouraged participants to enroll in other ComEd energy efficiency (EE) programs. If participation rates in other EE programs are the same for the HER participant and control groups, the savings estimates from the regression analyses are already "net" of savings from the other programs, as this indicates the HER program did not increase or decrease participation in the other EE programs. However, if the HER

[5] Median usage was calculated by Wave. Chronologically, the medians were 34.20, 32.90, 46.00, 31.10, 15.60 (AMI), 51.80 (Non-AMI), 38.80, 16.00 (Low), and 25.90 (High) kilowatt-hours (kWh) per day.

[6] Navigant prefers to report out the PPR model for two reasons. One, the implementer is also using a post-only model for evaluation. Two, although both the LFER and PPR models generate unbiased estimates of program savings, as an empirical matter—based on our past analyses and those in the academic literature—estimated savings from the PPR model tend to have lower standard errors than those from the LFER model, though the differences are usually very small.

program affects participation rates in other EE programs, then savings across all programs are lower than indicated by the simple summation of savings in the HER and EE programs. For instance, if the HER program increases participation in other EE programs, these savings from uplift may be allocated to either the HER program or the EE program, but cannot be allocated to both programs simultaneously.[7]

As data permitted, Navigant used a difference-in-difference (DID) statistic to estimate uplift in other EE programs. To calculate the DID statistic, Navigant subtracted the change in the participation rate in another EE program between PY7 and the pre-program year for the control group from the same change for the treatment group. For instance, if the rate of participation in an EE program during PY7 is five percent for the treatment group and three percent for the control group, and the rate of participation during the year before the start of the HER program is two percent for the treatment group and one percent for the control group, then the rate of uplift due to the HER program is one percent, as reflected in Equation 2-1.

Equation 2-1. DID Statistic Calculation

$$(PY7\ treatment\ group\ participation - prePY\ treatment\ group\ participation) - (PY7\ control\ group\ participation - prePY\ control\ group\ participation) = DID\ statistic$$

$$(5\% - 2\%) - (3\% - 1\%) = 1\%$$

The DID statistic generates an unbiased estimate of uplift when the baseline average rate of participation is the same for the treatment and control groups, or when they are different due only to differences between the two groups in time-invariant factors, such as the square footage of the residence.

An alternative statistic that generates an unbiased estimate of uplift when the baseline average rate of participation in the EE program is the same for the treatment and control groups is a simple difference in participation rates during PY6. Navigant uses this alternative statistic –the "post-only difference" (POD) statistic –in cases where the EE program did not exist for the entire pre-program year.

Navigant examined the uplift associated with four EE programs: the Fridge and Freezer Recycling (FFR) program, the Home Energy Assessment (HEA) program, the Home Energy Rebates (Rebate) program, and the Multi-family Energy Savings Program (MESP). The FFR program achieves energy savings through retirement and recycling of older, inefficient refrigerators, freezers, and room air conditioners. The HEA program replaced two PY6 programs: the Home Energy Savings (HES) program and the Home Energy Jumpstart (HEJ) program. The HEA program is offered jointly with the local gas utilities and achieves savings by providing direct installation of low-cost efficiency measures for single family homes, such as compacts fluorescent lightbulbs (CFLs) and low-flow showerheads. The Rebate program, which replaced the Complete System Replacement (CSR) program from PY6, offers weatherization and incentives to residential customers to encourage customer purchases of higher efficiency heating, ventilating, and air-conditioning (HVAC) equipment. The MESP offers direct installation of low-cost efficiency measures, such as water efficiency measures and CFLs at eligible multifamily residences.

For each EE program, double-counted savings were calculated separately for each wave of the HER program and for each persistence subgroup in Waves 1, 3, and 5 Non-AMI.

[7] It is not possible to avoid double counting of savings generated by programs for which tracking data are not available, such as upstream compact fluorescent lamp (CFL) programs.

2.5.2 Accounting for Legacy Uplift

The uplift adjustment methodology described in Section 2.5.1 only accounts for uplift which occurs in the current program year because EE program tracking files in any given program year only capture the new measures installed in that year, regardless of the expected measure lives.[8] However, for other EE programs with multi-year measure lives, HER program savings capture the portion of their savings due to uplift in each year of that program's measure life. For instance, a measure with a ten-year measure life that was installed in PY2 would generate savings captured in the HER program savings not just in PY2, but in PY3 through PY11 as well.

Consider the following concrete example. A household receiving home energy reports through the HER program enrolls in the FFR program, which has an eight year measure life, in PY6. The uplift adjustment described in the previous section subtracts the double counted savings from the HER program savings in PY6. In PY7 this household is still getting savings from the FFR program, but the PY7 uplift adjustment does not remove this savings in the second year of the household's enrollment in the FFR program. Thus, these savings are included in the PY7 HER program's savings when only the adjustment described in Section 2.5.2. In fact, the savings from this FFR program enrollment will be counted through PY13, which is inconsistent with Illinois's practice of only crediting utilities with first-year EE program savings.

Navigant accounted for legacy uplift by subtracting the double counted savings from previous years, adjusted for the average annual move-out rate, from the PY7 HER savings through the measure lives of the other EE programs.[9] The legacy uplift adjustment is shown in Equation 2-2.

Equation 2-2. Legacy Uplift Calculation

$$\text{HER Savings}_{PY}^{Adjusted} = \text{HER Savings}_{PY}^{Unadjusted} - \text{Uplift Savings}_{PY} - \sum_{i=1}^{PY-1} \text{"Live" Legacy Uplift Savings}_i \cdot (1\text{-MOR})^{PY-i}$$

where "'Live' Legacy Uplift Savings" refers to uplift savings where the other EE programs' measure lives have not yet run out (i.e., where measure life exceeds the difference between *PY* and *i*) and MOR refers to the move out rate.

The legacy uplift adjustment goes back to PY4 when Navigant first considered uplift for the HER program. In PY4, Navigant considered double-counted savings for the Fridge Freezer Recycle Rewards (FFRR), the Central Air Conditioning Efficiency Services (CACES), and the Single Family Home Performance (SFHP) programs. In PY5, Navigant considered double-counted savings for the FFRR, the CSR, the Clothes Washer Rebate (CW), the Multi-Family Home Energy Savings (MF), and the Single Family Home Energy Savings (SFHES) programs. The same programs were considered in PY6, with the exception of the CW program which was discontinued.

2.6 Process Evaluation

The PY7 HER program evaluation did not include a process evaluation.

[8] Tracking data files are set-up this way because, in conformity the Illinois Technical Reference Manual Section 3.2, savings are first-year savings, not lifetime savings.

[9] Since HER program participants are dropped from that program when they move, other EE programs' savings are no longer captured in the HER program savings from that point forward.

3 Gross Impact Evaluation

Total program savings are summarized in Table 3-1 below. The PY7 planning target for this program was 239,000 megawatt-hours (MWh). The implementer reported savings from the implementation contractor were 216,318 MWh. Verified savings, prior to uplift, were 206,938 MWh. Of that total, 928 MWh was due to PY7 uplift in other EE programs and 733 was due to legacy uplift, resulting in final verified savings of 205,278 MWh for PY7. This is a final verified realization rate of 95 percent.

Of the 205,278 MWh, 6,846 MWh (3.33 percent) came from the three TR groups who received no reports during PY7. Without these three groups, savings in PY7 were 198,432 MWh. The savings for these three groups are evidence of the fact that savings from HER programs persist after report are stopped.

Table 3-1. PY7 Total Program Electric Savings

Savings Category	Energy Savings (MWh)
Implementer Savings Estimate†	216,318
Verified Savings, Prior to Uplift Adjustment	206,938
PY7 Uplift Adjustment	928
Legacy Uplift Adjustment	733
Final Verified Savings	205,278
Final Verified Realization Rate‡	95%

Source: ComEd tracking data and Navigant analysis.
† This estimate comes from the implementation contractor's ex-post analysis of the program.
‡ The realization rate is calculated as the final verified savings divided by the implementer savings estimate.

3.1 PPR and LFER Model Parameter Estimates

The PPR and LFER models generate very similar results for program savings estimates. Navigant uses the PPR results for reporting total program savings for PY7.[10] Across the two models, the parameter estimates are not statistically different; that is, the estimates for each model are within the 90 percent confidence bounds for the other model. Furthermore, the pattern across the different program waves between the two models is very similar. Section 6.3 includes detailed estimate information for each wave and model.

3.2 Uplift of Savings in Other EE Programs

PPR program savings estimates include savings resulting from the uplift in participation in other EE programs caused by the HER program. To avoid double-counting savings, program savings due to this

[10] Navigant prefers to report out the PPR model for two reasons. One, the implementer is also using a post-only model for evaluation. Two, although both the LFER and PPR models generate unbiased estimates of program savings, as an empirical matter—based on our past analyses and those in the academic literature—estimated savings from the PPR model tend to have lower standard errors than those from the LFER model, though the differences are usually very small.

uplift must be counted towards either the HER program or the other EE programs, but not both programs. The uplift of savings in other EE programs was a very small proportion of the total savings: 1661 MWh, or 0.80 percent. The uplift can be broken down into uplift in PY7 and legacy uplift from previous program years. The PY7 uplift was 928 MWh or 0.45 percent of total program savings and the legacy uplift was 733 or 0.35 percent of total program savings.

Subtracting the savings uplift from total savings (206,939 MWh) generates a final savings estimate of 205,278 MWh. To put this in perspective, across all waves the weighted average percentage savings for PY7 due to the HER program was 1.13 percent, and removing the savings uplift in other EE programs reduces this value to 1.12 percent.[11]

Table 3-1 presents a summary of the double-counted savings due to PY7 and legacy uplift in other EE programs and the verified gross savings for the HER program obtained by removing these savings from the estimate of verified gross program savings prior to uplift adjustment, by program wave. Section 6.4.1 in the appendix presents the details of the calculation of the PY7 uplift for each of the four ComEd EE programs considered in the analysis and Section 6.4.2 presents the details of the legacy uplift. As previously mentioned, the programs included in the uplift analysis in PY7 were the FFR program, the HEA program, the Rebate program and the MESP.[12] Where possible, Navigant used a DID statistic to estimate double-counted savings, and otherwise used a simple comparison of the rate of participation in EE programs by treatment and control households in PY7 – the POD estimate of double-counted savings.

The estimate of double-counted savings is most likely an *overestimate* because it presumes participation in the other EE programs occurs at the very start of PY7. Under the more reasonable assumption that participation occurs at a uniform rate throughout the year, the estimate of double-counted savings would be approximately 831 MWh, half the estimated value of 1661 MWh. The upshot is that double counting of savings with other ComEd EE programs *is not a significant issue* for the HER program.

3.3 Verified Program Impact Results

Table 3-2 summarizes estimated program savings by wave. The number of participants, in the first row, represents the number of customers receiving reports in each wave, while the sample size – treatment, in the second row, indicates the number of customers with sufficient data for inclusion in the regression analysis. Across all waves, there were 1,716,492 participants for whom savings were applied to calculate total program savings. Navigant estimated separate savings for each wave and subgroup (for example, Wave 1 CR) using regression analysis as described in Section 2.4. The weighted average per customer savings estimate was 1.13 percent (120.56 kWh).

[11] Multiplying 1.13 percent (the percentage of total energy use saved) by 0.80 percent (the percentage of total savings uplift in other EE programs) generates the value 0.009 percent. Formally, as shown in the following calculation: 0.0113 × 0.0080 = 0.00009. Subtracting this value from 0.0113 gives 0.01121, or 1.121 percent.

[12] ComEd has other residential programs that were not included in the analysis. The Residential Lighting and Elementary Education programs do not track participation at the customer level, and so do not have the data necessary for the uplift analysis. Double counting between the Residential New Construction and HER programs is not possible due to the requirement that HER participants have sufficient historical usage data.

Table 3-2. PY7 HER Program Results, by Wave

Type of Statistic	Wave 1 CR	Wave 1 LR	Wave 1 TR	Wave 2	Wave 3 CR	Wave 3 LR	Wave 3 TR	Wave 4	Wave 5 AMI	Wave 5 Non-AMI CR	Wave 5 Non-AMI TR	Wave 6	Wave 7 Low Usage	Wave 7 High Usage	Total
Number of Participants	28,915	8,827	8,761	2,975	179,057	9,825	9,807	20,708	62,770	9,945	9,941	104,985	629,987	629,989	1,716,492
Sample Size – Treatment	21,852	6,712	6,680	2,265	146,486	8,020	7,956	17,372	41,139	5,529	5,486	79,897	575,681	578,861	1,503,936
Sample Size - Control	33,131			2,296	40,183			17,434	20,370	7,033		24,259	48,039	48,283	241,028
Percentage Savings	2.54%	2.52%	2.28%	2.83%	2.75%	2.79%	2.46%	2.46%	1.21%	1.68%	0.89%	1.64%	0.53%	0.99%	1.13%
Standard Error	*0.25%*	*0.40%*	*0.40%*	*0.90%*	*0.15%*	*0.31%*	*0.31%*	*0.24%*	*0.26%*	*0.48%*	*0.48%*	*0.17%*	*0.09%*	*0.08%*	-
kWh Savings Per Customer	272.84	271.74	246.42	295.81	410.66	415.93	362.95	242.12	58.46	236.35	125.21	213.55	30.17	93.22	120.56
Standard Error	*26.91*	*42.66*	*43.52*	*94.01*	*21.84*	*46.86*	*45.40*	*23.67*	*12.34*	*67.19*	*67.53*	*22.47*	*5.41*	*7.55*	-
Verified Gross Savings, Prior to Uplift Adjustment, MWh†	7,889	2,399	2,159	880	73,531	4,087	3,559	5,014	3,670	2,350	1,245	22,420	19,006	58,730	206,939
Standard Error	*778*	*377*	*381*	*280*	*3910*	*460*	*445*	*490*	*775*	*668*	*671*	*2359*	*3,407*	*4,927*	-
Savings Uplift in Other EE Programs in PY7, MWh‡	10	149	142	-11	17	10	-21	8	74	9	1	19	6	515	928
Legacy Savings Uplift in Other EE Programs, MWh‡	135	4	8	-7	471	-25	3	-9	73	6	-16	89	-	-	733
Verified Gross Savings, MWh†‡	7,744	2,246	2,009	898	73,043	4,102	3,577	5,015	3,523	2,335	1,260	22,312	19,000	58,215	205,278

Source: Navigant analysis

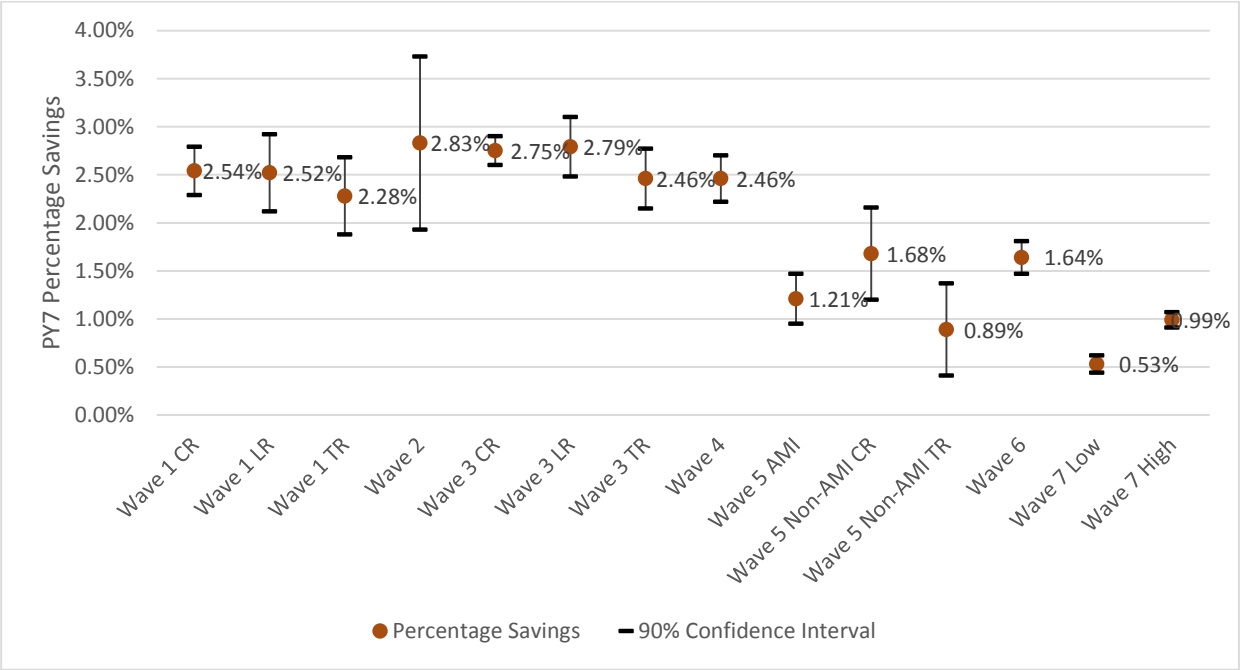
† Total savings are pro-rated for participants that closed their accounts during PY7.

‡ Negative double counted savings indicate that the participation rate in the EE program is higher for the control group than the treatment group. This lowers the baseline and underestimates HER program savings.

†‡ Gross savings adjusted for savings uplift are equal to gross savings less the uplift of savings in other EE programs.

Figure 3-1 shows the energy savings for each wave with the 90 percent confidence interval. Waves with larger confidence bounds mostly had smaller sample sizes, which reducing the level of certainty for percent savings estimates. For example, Wave 2 had a sample size of 2,265 participants and 2,296 controls and therefore had larger confidence bounds while Wave 7 Low had 575,681 participants and 48,039 controls and had smaller confidence bounds

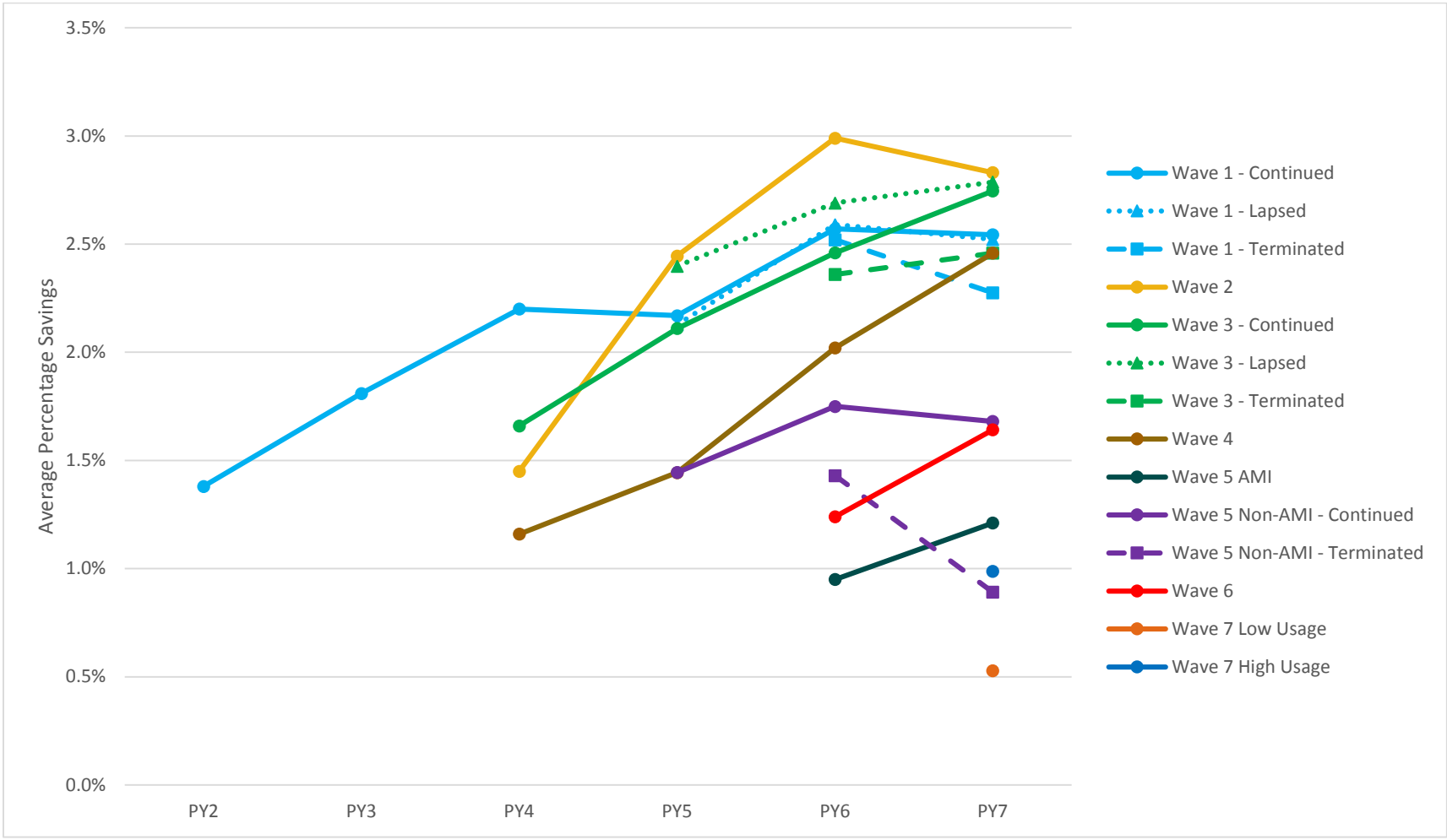
Figure 3-1. PY7 Percent Savings and 90 Percent Confidence Interval, by Wave



Source: *Navigant analysis*

Figure 3-2 combines PY7 results with those from previous years to show how the estimated percentage savings have changed multiple program years for each wave. With a few exceptions, such as Wave 2 from PY6 to PY7, savings each year have increased relative to the previous program year. Estimated savings for the Wave 3 LR participants exceeded estimated savings for the Wave 3 CR participants during PY5, PY6, and PY7 though the differences were not statistically significant and the difference has fallen over the three years. As noted in the PY5 report, Navigant identified statistically significant differences in pre-program usage patterns between the LR (referred to as TR in the PY5 report) and control groups for Waves 1 and 3, indicating that the assignment to the LR group is not consistent with an RCT and they are not drawn from the same population. Consequently, it is not possible to conclude that the difference in the savings rate estimates for the LR and CR groups is solely attributable to the lapse in reports. For Wave 1 CR and LR customers have had almost the exact same savings in PY5, PY6, and PY7. For the TR subgroups started in October 2013 for Waves 1, 3, and 5 Non-AMI estimated savings are at or below the CR group. The difference in savings between the TR and CR subgroups is very similar for Waves 1 and 3, with differences of 0.27 percentage points and 0.29 percentage points respectively. The difference is quite a bit larger for Wave 5 Non-AMI at 0.79 percentage points. This is not surprising since Wave 5 Non-AMI customers had only received reports for one year before they were terminated, while Waves 1 and 3 had received reports for four and two years respectively. Navigant is planning to conduct a separate study of the decay rates and the persistence of savings in the first year after reports were stopped for the three TR groups.

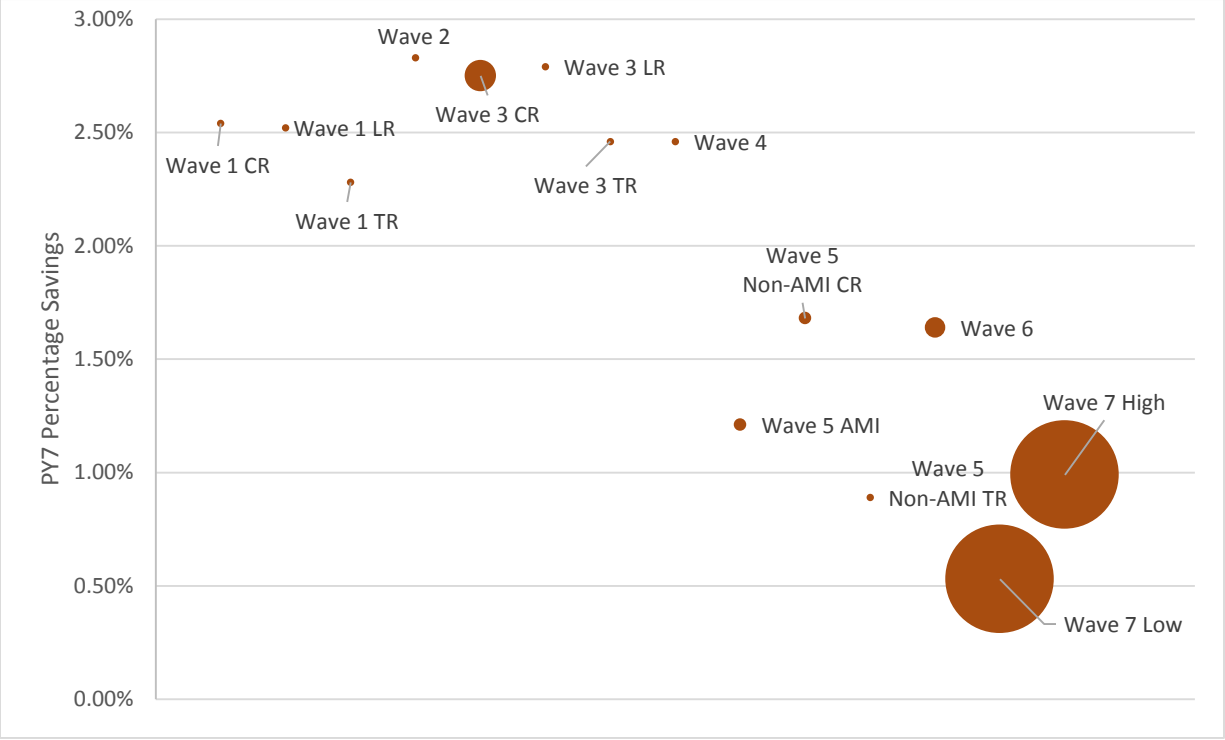
Figure 3-2. HER Program Savings over Time, by Wave



Source: Navigant analysis

Waves 1 through 4 entered PY7 with at least two full years in the program and each of these waves had program savings over two percent. Wave 5 AMI, Wave 5 Non-AMI CR and Wave 6 all entered PY7 with at least one full year in the program and they achieved savings of over one percent. Wave 5 Non-AMI TR had lower savings at just 0.89 percent, but this group had only been in the program one year before their reports were discontinued so it is expected that they would have a drop in savings. Wave 7 only started at the beginning of PY7, the high usage customers had savings of 0.99 percent and the low usage customers had savings of 0.53 percent. This is lower savings than any other wave, except Wave 5 AMI, had after one year in the program. Like Wave 7, Wave 5 AMI has fairly low usage compared to the other waves. The other waves had all reached savings of at least 1.1 percent after one year in the program. The lower savings for Wave 7 are likely due to the lower usage by these customers. Figure 3-3 shows estimated savings by wave with the relative weight by number of participants indicated by the size of the point on the graph. Wave 7 High and Wave 7 Low had the largest impacts on overall program savings rates as each had more participants than Waves 1 through 6 combined. This indicates that the relatively low savings for Wave 7 High and Low have a large effect of the average per customer savings for the program.

Figure 3-3. Savings Rates Weighted by Number of Participants, by Wave



Source: Navigant analysis

4 Net Impact Evaluation

A key feature of the RCT design of the HER program is that the analysis inherently estimates net savings because there are no participants who otherwise might have received the individualized reports in the absence of the program. While some customers receiving reports may have taken energy-conserving actions or purchased high-efficiency equipment anyway, the random selection of program participants (as opposed to voluntary participation) implies that the control group of customers *not* receiving reports is expected to exhibit the same degree of energy-conserving behavior and purchases. Thus, there is no free ridership, and no "net-to-gross" (NTG) adjustment is necessary.

5 Findings and Recommendations

The following section includes program findings and recommendations.[13] Across all waves, there were approximately 1.7 million participants for whom savings were calculated. Total verified savings for PY7 were 206,938 MWh prior to uplift and 205,321 MWh after the uplift adjustment.

Finding 1. In PY7 ComEd added Wave 7 with 1.2 million participants to the HER; this wave swamps the size of the older waves which combined have only 450,000 participants. While adding Wave 7 increased total verified savings for the program in PY7 by almost sixty percent (76,258 MWh) over PY6, the average savings per customer were 1.13 percent or 121 kWh per year in PY7; down from an average savings per customer of 1.94 percent or 289 kWh per year in PY6. The decrease in average savings per customer is mostly due to Wave 7, which has low average daily usage compared to Wave 1 through 6 and, therefore, lower average savings per customer: 0.99 percent for the high usage customers and 0.53 percent for the low usage customers. Outside of Wave 7 participants, percentage savings for Waves 1 through 6 in PY7 actually increased compared to PY6 to 2.16 percent.

Recommendation 1. With the low savings being realized by the Wave 7 customers, ComEd should adjust their future savings targets for this program. For Waves 1 through 6 average ramp up in the second year of reports has been 33 percent; if this pattern holds for Wave 7, PY8 savings would project to be 0.70 percent for Wave 7 Low and 1.32 percent for Wave 7 High. These forecasts for PY8 could be incorrect if Wave 7 follows a different pattern of ramp-up than the earlier waves.

Finding 2. Navigant reviewed older waves to identify potential opportunities for additional savings for the program. Waves 1 and 3 in particular, have higher ratios of treatment to control customers than the newer waves. Navigant did a preliminary power analysis and found that if 10,000 customers in the control group for Wave 1 were randomly selected to be placed into a new treatment wave, the new wave and each of three existing persistence subgroups in Wave 1 would have statistically significant savings estimates at the 90% level.

Recommendation 2. Given that high usage customers tend to save more and most of ComEd's high usage customers are already involved in the HER program, moving some of the Wave 1 and 3 customers into new treatment groups might allow ComEd to add more high usage customers as participants in the HER program. Since Navigant's preliminary power analysis showed proof of concept for moving control customers in Wave 1 to a new treatment wave without losing statistical significance, Navigant recommends that ComEd conduct a more involved power analysis to determine how many customers could be shifted from the control groups to new treatment waves for Waves 1 and 3.

[13] Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

6 Appendix

6.1 Detailed Data Cleaning

Table 6-1 provides a detailed account of the data cleaning done for this analysis. Navigant removed the following customers and data points from the analysis:

- Customers with an active account and less than 11 bills or any customer with more than 13 bills during PY7;
- Customers with less than 11 or more than 13 bills during the pre-program year;
- Observations with missing or negative usage;
- Observations with less than 20 or more than 40 days in the billing cycle;
- Outliers, defined as observations with average daily usage more than one order of magnitude from the median usage.[14]

Table 6-1 gives counts of customers removed for the first two steps and observations removed for the second two steps. The table also provides the percentage of customers or observations removed. It is evident from the table that the percentage of customers or observations removed is very similar across the treatment and control groups for each wave. This suggests that non-random biases were not introduced into the data by our cleaning.

[14] Median usage was calculated by Wave. Chronologically, the medians were 34.20, 32.90, 46.00, 31.10, 15.60 (AMI), 51.80 (Non-AMI), 38.80, 16.00 (Low), and 25.90 (High) kilowatt-hours (kWh) per day.

Table 6-1. Customers/Observations Removed by Data Cleaning Step and Wave

Data Cleaning Step	Wave 1		Wave 2		Wave 3	
	Treatment	Control	Treatment	Control	Treatment	Control
Customers with < 11 or > 13 bills during program year	61 / 0.1%	52 / 0.1%	4 / 0.1%	4 / 0.1%	351 / 0.2%	75 / 0.2%
Customers with < 11 or > 13 bills during pre-program year	386 / 0.8%	355 / 0.8%	57 / 1.9%	57 / 1.9%	4,270 / 2.2%	1,039 / 2.1%
Remove observations with missing or negative usage	0 / 0.0%	0 / 0.0%	0 / 0.0%	4 / 0.0%	11 / 0.0%	2 / 0.0%
Remove observations with >40 or <20 billing days	30,453 / 3.3%	28,902 / 3.3%	6,214 / 11.0%	6,215 / 10.9%	121,133 / 2.9%	30,305 / 3.0%
Remove outliers (avg. daily use 10x above/below median)	2,753 / 0.3%	2,446 / 0.3%	250 / 0.5%	264 / 0.5%	16,396 / 0.4%	3,752 / 0.4%
	Wave 4		Wave 5 AMI		Wave 5 Non-AMI	
	Treatment	Control	Treatment	Control	Treatment	Control
Customers with < 11 or > 13 bills during program year	34 / 0.2%	26 / 0.1%	95 / 0.2%	51 / 0.2%	78 / 0.4%	58 / 0.5%
Customers with < 11 or > 13 bills during pre-program year	297 / 1.4%	258 / 1.2%	7,576 / 12.1%	3,715 / 12%	4,749 / 24.1%	3,069 / 24.3%
Remove observations with missing or negative usage	0 / 0.0%	0 / 0.0%	0 / 0.0%	0 / 0.0%	4 / 0.0%	0 / 0.0%
Remove observations with >40 or <20 billing days	12,769 / 2.3%	12,829 / 2.9%	27,239 / 2.5%	13,754 / 2.5%	8,529 / 2.9%	5,524 / 2.9%
Remove outliers (avg. daily use 10x above/below median)	1,690 0.4%	1,568 / 0.4%	19,177 / 1.8%	9,458 / 1.8%	2075 / 0.7%	1,191 / 0.6%
	Wave 6		Wave 7 Low		Wave 7 High	
	Treatment	Control	Treatment	Control	Treatment	Control
Customers with < 11 or > 13 bills during program year	65 / 0.1%	22 / 0.1%	388 / 0.1%	26 / 0.0%	401 / 0.1%	33 / 0.1%
Customers with < 11 or > 13 bills during pre-program year	14,593 / 13.9%	4,138 / 13.1%	39,200 / 5.2%	3,243 / 6.2%	39,200 / 5.2%	3,243 / 6.2%
Remove observations with missing or negative usage	0 / 0.0%	0 / 0.0%	0 / 0.0%	0 / 0.0%	0 / 0.0%	0 / 0.0%
Remove observations with >40 or <20 billing days	61,952 / 3.2%	18,605 / 3.1%	33,060 / 0.2%	2,729 / 0.2%	31,995 / 0.2%	2,630 / 0.2%
Remove outliers (avg. daily use 10x above/below median)	9,467 / 0.5%	2,855 / 0.5%	1,160 / 0.0%	120 / 0.0%	772 / 0.0%	66 / 0.0%

Source: Navigant analysis

6.2 Detailed Impact Methodology

Navigant used two regression models to estimate impacts, a PPR model and an LFER model. The following sections present each model.

6.2.1 Post Program Regression Model

The PPR model controls for non-treatment differences in energy use between treatment and control customers using lagged energy use as an explanatory variable. In particular, the model frames energy use in calendar month *t* of the post-program period as a function of both the treatment variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between control and treatment customers will be reflected in differences in their past energy use, which is highly correlated with their current energy use. Formally, the model is shown in Equation 6-1.

Equation 6-1. Post Program Regression Model

$$ADU_{kt} = \beta_1 Treatment_k + \sum_J \beta_{2j} Month_{jt} + \sum_J \beta_{4j} Month_{jt} \cdot ADUlag_{kt} + \varepsilon_{kt}$$

Where

ADU_{kt}	is average daily consumption of kWh by household *k* in bill period *t*
$Treatment_k$	is a binary variable taking a value of 0 if household k is assigned to the control group, and 1 if assigned to the treatment group
$ADUlag_{kt}$	is household *k*'s energy use in the same calendar month of the pre-program year as the calendar month of month *t*
$Month_{jt}$	is a binary variable taking a value of 1 when j = t and 0 otherwise[15]
e_{kt}	is the cluster-robust error term for household *k* during billing cycle *t;* cluster-robust errors account for heteroskedasticity and autocorrelation at the household level.[16]

The coefficient b_1 is the estimate of average daily kWh energy savings due to the program in PY6.

[15] In other words, if there are *T* post-program months, there are *T* monthly dummy variables in the model, with the dummy variable $Month_{tt}$ the only one to take a value of 1 at time t. These are, in other words, monthly fixed effects.

[16] Ordinary Least Squares (OLS) regression models assume that the data are homoskedastic and not autocorrelated. If either of these assumptions is violated, the resulting standard errors of the parameter estimates are incorrect (usually underestimated). A random variable is heteroskedastic when the variance is not constant. A random variable is autocorrelated when the error term in one period is correlated with the error terms in at least some of the previous periods.

6.2.2 Linear Fixed Effects Regression Model

The simplest version of an LFER model convenient for exposition is one in which average daily consumption of kWh by household k in bill period t, denoted by ADU_{kt}, is a function of the following three terms:

1. The binary variable $Treatment_k$
2. The binary variable $Post_t$, taking a value of 0 if month t is in the pre-treatment period, and 1 if in the post-treatment period
3. The interaction between these variables, $Treatment_k \cdot Post_t$

Formally, the LFER model is showing in as shown in Equation 6-2.

Equation 6-2. Linear Fixed Effects Regression Model

$$ADU_{kt} = \alpha_{0k} + \alpha_1 Post_t + \alpha_2 Treatment_k \cdot Post_t + \varepsilon_{kt}$$

Three observations about this specification deserve comment. First, the coefficient α_{0k} captures all household-specific effects on energy use that do not change over time, including those that are unobservable. Second, α_1 captures the average effect *across all households* of being in the post-treatment period. Third, the effect of being both in the treatment group and in the post period—the effect directly attributable to the program—is captured by the coefficient α_2. In other words, whereas the coefficient α_1 captures the change in average daily kWh use across the pre- and post-treatment for the *control* group, the sum $\alpha_1 + \alpha_2$ captures this change for the treatment group, and so α_2 is the estimate of average daily kWh energy savings due to the program in PY7.

6.3 Detailed Impact Results: Parameter Estimates

Table 6-2 through Table 6-19 show the results of the PPR and LFER models for each wave. Across the two models, the parameter estimates are not statistically different; that is, the estimates for each model are within the 90 percent confidence bounds for the other model. Furthermore, the pattern across the different program waves between the two models is very similar.

Table 6-2. PPR Model Estimates, Wave 1

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-1.00	0.10	-10.14	0.00
yrmo201406	8.43	0.22	38.16	0.00
yrmo201407	7.92	0.23	33.80	0.00
yrmo201408	5.16	0.23	22.08	0.00
yrmo201409	8.39	0.24	35.70	0.00
yrmo201410	5.87	0.24	24.12	0.00
yrmo201411	5.22	0.26	19.71	0.00
yrmo201412	6.12	0.26	23.59	0.00
yrmo201501	7.48	0.25	30.17	0.00
yrmo201502	7.35	0.27	27.43	0.00
yrmo201503	5.78	0.30	19.46	0.00
yrmo201504	6.41	0.27	23.46	0.00
yrmo201505	5.49	0.27	20.59	0.00
treatment:LR	0.01	0.16	0.07	0.94
treatment:TR	0.11	0.16	0.65	0.52
yrmo201406:pre.use	0.87	0.01	127.49	0.00
yrmo201407:pre.use	0.76	0.00	159.03	0.00
yrmo201408:pre.use	0.70	0.00	161.90	0.00
yrmo201409:pre.use	0.79	0.01	149.84	0.00
yrmo201410:pre.use	0.68	0.01	94.78	0.00
yrmo201411:pre.use	0.77	0.01	97.04	0.00
yrmo201412:pre.use	0.76	0.01	120.05	0.00
yrmo201501:pre.use	0.71	0.01	133.42	0.00
yrmo201502:pre.use	0.75	0.01	114.36	0.00
yrmo201503:pre.use	0.84	0.01	103.98	0.00
yrmo201504:pre.use	0.70	0.01	85.86	0.00
yrmo201505:pre.use	0.77	0.01	88.08	0.00
Residual standard error: 16.37 on 709648 degrees of freedom				
Multiple R-squared: 0.88, Adjusted R-squared: 0.88				
F-statistic: 1.928e+05 on 27 and 709648 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-3. LFER Model Estimates, Wave 1

	Estimate	Std. Error	t value	Pr(>|t|)
post	-3.98	0.07	-61.05	0.00
post.trt	-0.92	0.10	-8.94	0.00
post.trt:LR	0.07	0.17	0.44	0.66
post.trt:TR	0.12	0.17	0.70	0.48
Total Sum of Squares: 519610000; Residual Sum of Squares: 512180000				
R-Squared: 0.014292; Adj. R-Squared : 0.013563				
F-statistic: 6035.63 on 4 and 1665122 DF, p-value: < 2.22e-16				

Source: Navigant analysis

Table 6-4. PPR Model Estimates, Wave 2

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-1.072	0.341	-3.146	0.002
yrmo201406	9.602	0.699	13.730	0.000
yrmo201407	11.849	0.848	13.967	0.000
yrmo201408	12.111	0.839	14.435	0.000
yrmo201409	7.906	0.662	11.942	0.000
yrmo201410	7.851	0.753	10.431	0.000
yrmo201411	11.823	0.907	13.035	0.000
yrmo201412	13.108	0.921	14.237	0.000
yrmo201501	12.569	1.052	11.953	0.000
yrmo201502	10.153	1.009	10.067	0.000
yrmo201503	10.728	1.360	7.889	0.000
yrmo201504	12.318	1.184	10.405	0.000
yrmo201505	10.148	0.635	15.994	0.000
yrmo201406:pre.use	0.681	0.020	33.697	0.000
yrmo201407:pre.use	0.548	0.017	32.573	0.000
yrmo201408:pre.use	0.522	0.015	34.321	0.000
yrmo201409:pre.use	0.746	0.017	43.250	0.000
yrmo201410:pre.use	0.651	0.024	27.231	0.000
yrmo201411:pre.use	0.608	0.028	21.992	0.000
yrmo201412:pre.use	0.704	0.028	25.403	0.000
yrmo201501:pre.use	0.607	0.023	26.160	0.000
yrmo201502:pre.use	0.662	0.023	28.263	0.000
yrmo201503:pre.use	0.765	0.037	20.612	0.000
yrmo201504:pre.use	0.579	0.038	15.406	0.000
yrmo201505:pre.use	0.596	0.021	28.465	0.000
Residual standard error: 16.46 on 36442 degrees of freedom				
Multiple R-squared: 0.8581, Adjusted R-squared: 0.858				
F-statistic: 8813 on 25 and 36442 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-5. LFER Model Estimates, Wave 2

	Estimate	Std. Error	t value	Pr(>|t|)
post	-4.768	0.229	-20.831	0.000
post.trt	-1.109	0.332	-3.337	0.001
Total Sum of Squares: 30601000				
Residual Sum of Squares: 29984000				
R-Squared: 0.020157				
Adj. R-Squared : 0.018987				
F-statistic: 973.375 on 2 and 94632 DF, p-value: < 2.22e-16				

Source: Navigant analysis

Table 6-6. PPR Model Estimates, Wave 3

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-1.383	0.074	-18.807	0.000
yrmo201406	14.426	0.180	80.156	0.000
yrmo201407	17.277	0.183	94.221	0.000
yrmo201408	17.885	0.197	90.815	0.000
yrmo201409	22.117	0.197	112.005	0.000
yrmo201410	18.386	0.237	77.530	0.000
yrmo201411	15.635	0.256	61.096	0.000
yrmo201412	13.106	0.199	65.946	0.000
yrmo201501	13.370	0.189	70.627	0.000
yrmo201502	11.905	0.201	59.293	0.000
yrmo201503	10.973	0.265	41.360	0.000
yrmo201504	10.353	0.205	50.530	0.000
yrmo201505	16.544	0.219	75.601	0.000
treatment:LR	-0.022	0.148	-0.146	0.884
treatment:TR	0.149	0.144	1.032	0.302
yrmo201406:pre.use	0.614	0.003	193.460	0.000
yrmo201407:pre.use	0.530	0.002	219.589	0.000
yrmo201408:pre.use	0.479	0.002	192.191	0.000
yrmo201409:pre.use	0.557	0.003	169.472	0.000
yrmo201410:pre.use	0.511	0.006	86.339	0.000
yrmo201411:pre.use	0.636	0.006	101.943	0.000
yrmo201412:pre.use	0.701	0.004	195.403	0.000
yrmo201501:pre.use	0.670	0.003	224.718	0.000
yrmo201502:pre.use	0.716	0.003	206.195	0.000
yrmo201503:pre.use	0.840	0.006	150.960	0.000
yrmo201504:pre.use	0.660	0.005	143.334	0.000
yrmo201505:pre.use	0.516	0.005	97.178	0.000
Residual standard error: 20.18 on 2121153 degrees of freedom				
Multiple R-squared: 0.8742, Adjusted R-squared: 0.8742				
F-statistic: 5.458e+05 on 27 and 2121153 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-7. LFER Model Estimates, Wave 3

	Estimate	Std. Error	t value	Pr(>|t|)
post	-6.805	0.063	-107.899	0.000
post.trt	-1.341	0.071	-18.833	0.000
post.trt:LR	0.006	0.145	0.042	0.966
post.trt:TR	0.282	0.143	1.970	0.049
Total Sum of Squares: 3033600000				
Residual Sum of Squares: 2964300000				
R-Squared: 0.022863				
Adj. R-Squared : 0.021746				
F-statistic: 27545.1 on 4 and 4709038 DF, p-value: < 2.22e-16				

Source: Navigant analysis

Table 6-8. PPR Model Estimates, Wave 4

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-0.801	0.078	-10.229	0.000
yrmo201406	12.512	0.323	38.769	0.000
yrmo201407	19.679	0.325	60.538	0.000
yrmo201408	17.972	0.302	59.586	0.000
yrmo201409	17.101	0.391	43.685	0.000
yrmo201410	14.764	0.422	35.016	0.000
yrmo201411	14.108	0.490	28.811	0.000
yrmo201412	11.385	0.391	29.122	0.000
yrmo201501	17.447	0.374	46.689	0.000
yrmo201502	15.692	0.347	45.179	0.000
yrmo201503	16.102	0.420	38.347	0.000
yrmo201504	14.746	0.385	38.293	0.000
yrmo201505	14.962	0.347	43.154	0.000
yrmo201406:pre.use	0.575	0.009	63.018	0.000
yrmo201407:pre.use	0.425	0.007	64.303	0.000
yrmo201408:pre.use	0.374	0.005	69.132	0.000
yrmo201409:pre.use	0.573	0.010	55.459	0.000
yrmo201410:pre.use	0.413	0.016	25.734	0.000
yrmo201411:pre.use	0.457	0.018	25.560	0.000
yrmo201412:pre.use	0.653	0.013	52.254	0.000
yrmo201501:pre.use	0.453	0.010	46.277	0.000
yrmo201502:pre.use	0.494	0.010	48.979	0.000
yrmo201503:pre.use	0.523	0.014	36.695	0.000
yrmo201504:pre.use	0.383	0.014	27.798	0.000
yrmo201505:pre.use	0.352	0.013	27.648	0.000
Residual standard error: 11.08 on 365945 degrees of freedom				
Multiple R-squared: 0.8994, Adjusted R-squared: 0.8994				
F-statistic: 1.309e+05 on 25 and 365945 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-9. LFER Model Estimates, Wave 4

	Estimate	Std. Error	t value	Pr(>|t|)
post	-3.268	0.058	-56.653	0.000
post.trt	-0.789	0.081	-9.781	0.000
Total Sum of Squares: 151800000				
Residual Sum of Squares: 149190000				
R-Squared: 0.017161				
Adj. R-Squared : 0.016332				
F-statistic: 7011.72 on 2 and 803152 DF, p-value: < 2.22e-16				

Source: Navigant analysis

Table 6-10. PPR Model Estimates, Wave 5 AMI

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-0.235	0.050	-4.738	0.000
yrmo201406	2.147	0.079	27.100	0.000
yrmo201407	4.912	0.088	55.759	0.000
yrmo201408	3.046	0.092	33.216	0.000
yrmo201409	3.224	0.084	38.477	1.976e-323
yrmo201410	2.478	0.081	30.645	0.000
yrmo201411	2.279	0.090	25.286	0.000
yrmo201412	3.040	0.100	30.343	0.000
yrmo201501	3.395	0.109	31.293	0.000
yrmo201502	2.740	0.113	24.189	0.000
yrmo201503	2.961	0.130	22.710	0.000
yrmo201504	2.645	0.096	27.622	0.000
yrmo201505	3.136	0.083	37.642	9.884e-310
yrmo201406:pre.use	0.798	0.004	192.839	0.000
yrmo201407:pre.use	0.645	0.003	193.478	0.000
yrmo201408:pre.use	0.578	0.003	190.494	0.000
yrmo201409:pre.use	0.892	0.004	228.653	0.000
yrmo201410:pre.use	0.812	0.005	155.854	0.000
yrmo201411:pre.use	0.866	0.006	146.216	0.000
yrmo201412:pre.use	0.886	0.006	155.025	0.000
yrmo201501:pre.use	0.885	0.006	157.543	0.000
yrmo201502:pre.use	0.923	0.006	152.749	0.000
yrmo201503:pre.use	0.970	0.008	124.064	0.000
yrmo201504:pre.use	0.859	0.006	132.624	0.000
yrmo201505:pre.use	0.721	0.005	136.494	0.000
Residual standard error: 8.04 on 637898 degrees of freedom				
Multiple R-squared: 0.885, Adjusted R-squared: 0.885				
F-statistic: 1.96e+05 on 25 and 637898 DF, p-value: <0.0000000000000002				

Source: Navigant analysis

Table 6-11. LFER Model Estimates, Wave 5 AMI

	Estimate	Std. Error	t value	Pr(>|t|)
post	-0.872	0.042	-20.518	0.000
post.trt	-0.213	0.052	-4.128	0.000
Total Sum of Squares: 120000000				
Residual Sum of Squares: 120000000				
R-Squared: 0.0029				
Adj. R-Squared : 0.00275				
F-statistic: 2192.78 on 2 and 1508110 DF, p-value: <0.0000000000000002				

Source: Navigant analysis

Table 6-12. PPR Model Estimates, Wave 5 Non-AMI

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-1.016	0.289	-3.517	0.000
yrmo201406	7.750	0.570	13.594	0.000
yrmo201407	11.715	0.661	17.726	0.000
yrmo201408	9.623	0.673	14.304	0.000
yrmo201409	12.042	0.630	19.104	0.000
yrmo201410	12.620	1.062	11.889	0.000
yrmo201411	10.827	1.434	7.552	0.000
yrmo201412	9.952	1.232	8.075	0.000
yrmo201501	5.968	0.798	7.478	0.000
yrmo201502	6.573	0.822	7.995	0.000
yrmo201503	5.239	1.050	4.990	0.000
yrmo201504	17.391	0.892	19.505	0.000
yrmo201505	12.167	0.787	15.463	0.000
treatment:TR	0.471	0.303	1.554	0.120
yrmo201406:pre.use	0.785	0.010	79.117	0.000
yrmo201407:pre.use	0.716	0.010	74.483	0.000
yrmo201408:pre.use	0.625	0.009	72.213	0.000
yrmo201409:pre.use	0.816	0.011	75.152	0.000
yrmo201410:pre.use	0.711	0.024	30.220	0.000
yrmo201411:pre.use	0.783	0.028	28.009	0.000
yrmo201412:pre.use	0.905	0.020	45.510	0.000
yrmo201501:pre.use	0.946	0.012	80.797	0.000
yrmo201502:pre.use	0.959	0.013	76.665	0.000
yrmo201503:pre.use	1.074	0.019	57.989	0.000
yrmo201504:pre.use	0.700	0.020	35.754	0.000
yrmo201505:pre.use	0.694	0.017	40.757	0.000
Residual standard error: 25.36 on 184778 degrees of freedom				
Multiple R-squared: 0.8755, Adjusted R-squared: 0.8755				
F-statistic: 5e+04 on 26 and 184778 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-13. LFER Model Estimates, Wave 5 Non-AMI

	Estimate	Std. Error	t value	Pr(>|t|)
post	-1.280	0.200	-6.392	post
post.trt	-0.861	0.295	-2.925	post.trt
post.trt:TR	0.397	0.310	1.280	post.trt:TR
Total Sum of Squares: 361880000				
Residual Sum of Squares: 361590000				
R-Squared: 0.00080244				
Adj. R-Squared : 0.00076062				
F-statistic: 119.185 on 3 and 445226 DF, p-value: < 2.22e-16				

Source: Navigant analysis

Table 6-14. PPR Model Estimates, Wave 6

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-0.720	0.076	-9.503	0.000
yrmo201406	5.131	0.262	19.577	0.000
yrmo201407	3.612	0.292	12.362	0.000
yrmo201408	6.036	0.284	21.257	0.000
yrmo201409	6.873	0.294	23.356	0.000
yrmo201410	6.172	0.302	20.468	0.000
yrmo201411	4.489	0.283	15.877	0.000
yrmo201412	3.856	0.297	12.965	0.000
yrmo201501	4.935	0.252	19.585	0.000
yrmo201502	5.013	0.245	20.503	0.000
yrmo201503	4.438	0.246	18.006	0.000
yrmo201504	6.220	0.232	26.782	0.000
yrmo201505	3.661	0.217	16.895	0.000
yrmo201406:pre.use	0.782	0.006	138.492	0.000
yrmo201407:pre.use	0.659	0.004	154.156	0.000
yrmo201408:pre.use	0.676	0.005	144.017	0.000
yrmo201409:pre.use	0.829	0.006	138.422	0.000
yrmo201410:pre.use	0.792	0.009	89.156	0.000
yrmo201411:pre.use	0.836	0.008	108.147	0.000
yrmo201412:pre.use	0.947	0.007	132.239	0.000
yrmo201501:pre.use	0.879	0.005	164.342	0.000
yrmo201502:pre.use	0.862	0.005	159.904	0.000
yrmo201503:pre.use	0.883	0.006	153.624	0.000
yrmo201504:pre.use	0.711	0.006	117.960	0.000
yrmo201505:pre.use	0.803	0.006	131.810	0.000
Residual standard error: 16.25 on 1073271 degrees of freedom				
Multiple R-squared: 0.9015, Adjusted R-squared: 0.9014				
F-statistic: 3.927e+05 on 25 and 1073271 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-15. LFER Model Estimates, Wave 6

	Estimate	Std. Error	t value	Pr(>|t|)
post	-4.782	0.067	-71.800	0.000
post.trt	-0.755	0.076	-9.938	0.000
Total Sum of Squares: 916160000				
Residual Sum of Squares: 899820000				
R-Squared: 0.017834				
Adj. R-Squared : 0.016977				
F-statistic: 21150.1 on 2 and 2329554 DF, p-value: < 2.22e-16				

Source: Navigant analysis

Table 6-16. PPR Model Estimates, Wave 7 Low

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-0.090	0.016	-5.578	0.000
yrmo201406	6.137	0.047	130.595	0.000
yrmo201407	8.476	0.036	232.754	0.000
yrmo201408	7.744	0.038	202.706	0.000
yrmo201409	5.507	0.041	135.424	0.000
yrmo201410	6.466	0.044	145.972	0.000
yrmo201411	6.155	0.063	98.023	0.000
yrmo201412	6.271	0.050	125.243	0.000
yrmo201501	7.059	0.049	143.643	0.000
yrmo201502	8.339	0.043	193.685	0.000
yrmo201503	7.019	0.054	130.591	0.000
yrmo201504	6.547	0.055	119.358	0.000
yrmo201505	5.497	0.056	99.003	0.000
yrmo201406:pre.use	0.678	0.003	235.010	0.000
yrmo201407:pre.use	0.553	0.001	384.702	0.000
yrmo201408:pre.use	0.578	0.002	352.292	0.000
yrmo201409:pre.use	0.675	0.002	399.790	0.000
yrmo201410:pre.use	0.475	0.003	163.641	0.000
yrmo201411:pre.use	0.559	0.004	130.229	0.000
yrmo201412:pre.use	0.621	0.003	216.216	0.000
yrmo201501:pre.use	0.584	0.003	229.994	0.000
yrmo201502:pre.use	0.479	0.002	215.816	0.000
yrmo201503:pre.use	0.571	0.003	181.107	0.000
yrmo201504:pre.use	0.488	0.004	129.053	0.000
yrmo201505:pre.use	0.560	0.004	136.079	0.000
Residual standard error: 5.471 on 6414720 degrees of freedom				
Multiple R-squared: 0.9121, Adjusted R-squared: 0.9121				
F-statistic: 2.663e+06 on 25 and 6414720 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-17. LFER Model Estimates, Wave 7 Low

	Estimate	Std. Error	t value	Pr(>|t|)
post	-4.768	0.229	-20.831	0.000
post.trt	-1.109	0.332	-3.337	0.001
Total Sum of Squares: 30601000				
Residual Sum of Squares: 29984000				
R-Squared: 0.020157				
Adj. R-Squared : 0.018987				
F-statistic: 973.375 on 2 and 94632 DF, p-value: < 2.22e-16				

Source: Navigant analysis

Table 6-18. PPR Model Estimates, Wave 7 High

	Estimate	Std. Error	t value	Pr(>|t|)
treatment	-0.274	0.023	-11.920	0.000
yrmo201406	7.501	0.069	108.147	0.000
yrmo201407	10.209	0.062	165.118	0.000
yrmo201408	9.350	0.062	149.806	0.000
yrmo201409	6.780	0.063	108.455	0.000
yrmo201410	7.897	0.068	116.297	0.000
yrmo201411	7.319	0.093	78.966	0.000
yrmo201412	7.739	0.077	100.717	0.000
yrmo201501	9.517	0.067	142.242	0.000
yrmo201502	10.822	0.062	173.249	0.000
yrmo201503	9.365	0.076	123.973	0.000
yrmo201504	9.567	0.078	122.974	0.000
yrmo201505	7.322	0.087	84.234	0.000
yrmo201406:pre.use	0.773	0.003	295.725	0.000
yrmo201407:pre.use	0.646	0.002	399.042	0.000
yrmo201408:pre.use	0.669	0.002	382.369	0.000
yrmo201409:pre.use	0.723	0.002	430.674	0.000
yrmo201410:pre.use	0.571	0.003	203.717	0.000
yrmo201411:pre.use	0.657	0.004	167.481	0.000
yrmo201412:pre.use	0.697	0.003	261.287	0.000
yrmo201501:pre.use	0.635	0.002	308.649	0.000
yrmo201502:pre.use	0.551	0.002	286.041	0.000
yrmo201503:pre.use	0.626	0.003	235.591	0.000
yrmo201504:pre.use	0.511	0.003	156.111	0.000
yrmo201505:pre.use	0.619	0.004	154.289	0.000
Residual standard error: 8.483 on 6532449 degrees of freedom				
Multiple R-squared: 0.9209, Adjusted R-squared: 0.9209				
F-statistic: 3.043e+06 on 25 and 6532449 DF, p-value: < 2.2e-16				

Source: Navigant analysis

Table 6-19. LFER Model Estimates, Wave 7 High

	Estimate	Std. Error	t value	Pr(>|t|)
post	-1.875	0.022	-83.355	0.000
post.trt	-0.261	0.023	-11.119	0.000
Residual standard error: 10.93 on 7012324 degrees of freedom				
Multiple R-squared: 0.009037, Adjusted R-squared: 0.009036				
F-statistic: 3.197e+04 on 2 and 7012324 DF, p-value: < 2.2e-16				

Source: Navigant analysis

6.4 Savings Due to Participation Uplift in Other EE Programs

6.4.1 Uplift in PY7

Table 6-20 through Table 6-33 present program savings due to participation uplift in other EE programs. Each table provides the uplift for a single program group in each of four EE programs for which estimates of deemed savings are available: the Fridge and Freezer Recycling (FFR) program, the Home Energy Assessment (HEA) program, the Home Energy Rebates (Rebate) program, and the Multi-family Energy Savings Program (MESP). Average FFR program savings are average net verified savings. Average HEA and Rebate program savings are ex-ante savings. Average MESP savings are average gross verified savings.

In all tables, a dash (-) in a row concerning the change in rate of participation from the pre-program year indicates the EE program did not exist for the entire pre-program year. For all cases where the EE program did not exist in the pre-program year, the estimate is based on a POD statistic, otherwise it is based on a DID statistic.

The tables also include the percentage change in EE program participation rate for HER participants. This differs from the change in EE program participation rate for the entire EE program, which is not reported here. These rates should be interpreted with caution because they likely have very wide error bounds, many of which likely include zero. The calculation of standard errors on these rates is not straightforward and therefore Navigant does not report them here.

Table 6-20. Estimates of Double-Counted Savings: Wave 1, CR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	28,915	28,915	28,915	28,915
Rate of participation, PY7 (%)	1.32%	0.05%	0.03%	0.03%
Change in rate of participation from pre-program year (%)	0.81%	-	-	-
# HER control households	28,925	28,925	28,925	28,925
Rate of participation, PY7 (%)	1.30%	0.03%	0.06%	0.02%
Change in rate of participation from pre-program year (%)	0.77%	-	-	-
DID/POD statistic	0.05%	0.02%	-0.02%	0.01%
Change in program participation due to HER program	13	5	-6	3
Statistically significant at the 90% confidence level?	No	No	No	No
Savings attributable to other programs (kWh)	7,741	2,502	-1,564	1,781
Percentage change in EE program participation rate for HER participants	4%	50%	-37%	50%

Source: Navigant analysis

Table 6-21. Estimates of Double-Counted Savings: Wave 1, LR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	8,827	8,827	8,827	8,827
Rate of participation, PY6 (%)	5.44%	0.19%	0.14%	0.14%
Change in rate of participation from pre-program year (%)	3.36%	-	-	-
# HER control households	43,861	43,861	43,861	3,861
Rate of participation, PY6 (%)	1.32%	0.04%	0.04%	0.02%
Change in rate of participation from pre-program year (%)	0.80%	-	-	-
DID/POD statistic	2.57%	0.15%	0.09%	0.12%
Change in program participation due to HER program	227	14	8	11
Statistically significant at the 90% confidence level?	Yes	Yes	Yes	Yes
Savings attributable to other programs (kWh)	134,125	6,789	2,133	6,284
Percentage change in EE program participation rate for HER participants	89%	397%	214%	752%

Source: Navigant analysis

Table 6-22. Estimates of Double-Counted Savings: Wave 1, TR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	8,761	8,761	8,761	8,761
Rate of participation, PY6 (%)	5.49%	0.22%	0.15%	0.17%
Change in rate of participation from pre-program year (%)	3.18%	-	-	-
# HER control households	43,861	43,861	43,861	43,861
Rate of participation, PY6 (%)	1.32%	0.04%	0.04%	0.02%
Change in rate of participation from pre-program year (%)	0.80%	-	-	-
DID/POD statistic	2.39%	0.18%	0.11%	0.16%
Change in program participation due to HER program	209	16	9	14
Statistically significant at the 90% confidence level?	Yes	Yes	Yes	Yes
Savings attributable to other programs (kWh)	123,781	7,802	2,402	8,070
Percentage change in EE program participation rate for HER participants	77%	460%	243%	973%

Source: Navigant analysis

Table 6-23. Estimates of Double-Counted Savings: Wave 2

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	2,975	2,975	2,975	2,975
Rate of participation, PY6 (%)	1.21%	0.03%	0.07%	0.00%
Change in rate of participation from pre-program year (%)	0.13%	-	-	-
# HER control households	2,976	2,976	2,976	2,976
Rate of participation, PY6 (%)	1.48%	0.00%	0.10%	0.00%
Change in rate of participation from pre-program year (%)	0.77%	-	-	-
DID/POD statistic	-0.64%	0.03%	-0.03%	0.00%
Change in program participation due to HER program	-19	1	-1	0
Statistically significant at the 90% confidence level?	Yes	No	No	0
Savings attributable to other programs (kWh)	-11,243	500	-261	0
Percentage change in EE program participation rate for HER participants	-35%	0%	-33%	0%

Source: Navigant analysis

Table 6-24. Estimates of Double-Counted Savings: Wave 3, CR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	179,057	79,057	179,057	179,057
Rate of participation, PY6 (%)	1.26%	0.08%	0.01%	0.03%
Change in rate of participation from pre-program year (%)	-1.34%	-	-	-
# HER control households	46,636	46,636	46,636	46,636
Rate of participation, PY6 (%)	1.23%	0.06%	0.00%	0.02%
Change in rate of participation from pre-program year (%)	-1.31%	-	-	-
DID/POD statistic	-0.03%	0.02%	0.01%	0.02%
Change in program participation due to HER program	-47	42	14	34
Statistically significant at the 90% confidence level?	No	No	Yes	Yes
Savings attributable to other programs (kWh)	-28,068	21,248	3,694	20,246
Percentage change in EE program participation rate for HER participants	-2%	40%	369%	127%

Source: Navigant analysis

Table 6-25. Estimates of Double-Counted Savings: Wave 3, LR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	9,825	9,825	9,825	9,825
Rate of participation, PY6 (%)	1.49%	0.07%	0.00%	0.01%
Change in rate of participation from pre-program year (%)	-1.14%	-	-	-
# HER control households	49,060	49,060	49,060	49,060
Rate of participation, PY6 (%)	1.23%	0.06%	0.00%	0.01%
Change in rate of participation from pre-program year (%)	-1.30%	-	-	-
DID/POD statistic	0.16%	0.01%	0.00%	0.00%
Change in program participation due to HER program	16	1	0	0
Statistically significant at the 90% confidence level?	No	No	No	No
Savings attributable to other programs (kWh)	9,335	696	-52	-238
Percentage change in EE program participation rate for HER participants	12%	25%	-100%	-29%

Source: Navigant analysis

Table 6-26. Estimates of Double-Counted Savings: Wave 3, TR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	9,807	9,807	9,807	9,807
Rate of participation, PY6 (%)	1.26%	0.04%	0.01%	0.01%
Change in rate of participation from pre-program year (%)	-1.65%	-	-	-
# HER control households	49,060	49,060	49,060	49,060
Rate of participation, PY6 (%)	1.23%	0.06%	0.00%	0.01%
Change in rate of participation from pre-program year (%)	-1.30%	-	-	-
DID/POD statistic	-0.35%	-0.02%	0.01%	0.00%
Change in program participation due to HER program	-34	-2	1	0
Statistically significant at the 90% confidence level?	Yes	No	No	No
Savings attributable to other programs (kWh)	-20,403	-799	209	-237
Percentage change in EE program participation rate for HER participants	-22%	-29%	400%	-29%

Source: Navigant analysis

Table 6-27. Estimates of Double-Counted Savings: Wave 4

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	20,708	20,708	20,708	20,708
Rate of participation, PY6 (%)	1.28%	0.10%	0.01%	0.03%
Change in rate of participation from pre-program year (%)	-0.63%	-	-	-
# HER control households	20,726	20,726	20,726	20,726
Rate of participation, PY6 (%)	1.18%	0.05%	0.02%	0.04%
Change in rate of participation from pre-program year (%)	-0.67%	-	-	-
DID/POD statistic	0.04%	0.05%	-0.01%	-0.01%
Change in program participation due to HER program	9	10	-3	-3
Statistically significant at the 90% confidence level?	No	Yes	No	No
Savings attributable to other programs (kWh)	5,257	5,005	-782	-1,775
Percentage change in EE program participation rate for HER participants	3%	91%	-60%	-33%

Source: Navigant analysis

Table 6-28. Estimates of Double-Counted Savings: Wave 5 AMI

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	62,770	62,770	62,770	62,770
Rate of participation, PY6 (%)	0.62%	0.09%	0.09%	0.01%
Change in rate of participation from pre-program year (%)	-0.40%	-	-	-
# HER control households	31,035	31,035	31,035	31,035
Rate of participation, PY6 (%)	0.62%	0.08%	0.09%	0.01%
Change in rate of participation from pre-program year (%)	-0.59%	-	-	-
DID/POD statistic	0.19%	0.01%	0.00%	0.01%
Change in program participation due to HER program	117	6	-2	4
Statistically significant at the 90% confidence level?	Yes	No	No	No
Savings attributable to other programs (kWh)	69,326	3,218	-426	2,346
Percentage change in EE program participation rate for HER participants	43%	13%	-3%	98%

Source: Navigant analysis

Table 6-29. Estimates of Double-Counted Savings: Wave 5 Non-AMI, CR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	9,945	9,945	9,945	9,945
Rate of participation, PY6 (%)	0.63%	0.02%	0.04%	0.03%
Change in rate of participation from pre-program year (%)	-0.64%	-0.04%	-	-
# HER control households	12,756	12,756	12,756	12,756
Rate of participation, PY6 (%)	0.61%	0.05%	0.02%	0.01%
Change in rate of participation from pre-program year (%)	-0.80%	0.01%	-	-
DID/POD statistic	0.16%	-0.05%	0.02%	0.02%
Change in program participation due to HER program	16	-5	2	2
Statistically significant at the 90% confidence level?	No	Yes	No	No
Savings attributable to other programs (kWh)	9,189	-2,390	433	1,317
Percentage change in EE program participation rate for HER participants	33%	-70%	71%	285%

Source: Navigant analysis

Table 6-30. Estimates of Double-Counted Savings: Wave 5 Non-AMI, TR Persistence Group

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	9,941	9,941	9,941	9,941
Rate of participation, PY6 (%)	0.70%	0.05%	0.03%	0.01%
Change in rate of participation from pre-program year (%)	-0.79%	0.02%	-	-
# HER control households	12,756	12,756	12,756	12,756
Rate of participation, PY6 (%)	0.61%	0.05%	0.02%	0.01%
Change in rate of participation from pre-program year (%)	-0.80%	0.01%	-	-
DID/POD statistic	0.00%	0.01%	0.01%	0.00%
Change in program participation due to HER program	0	1	1	0
Statistically significant at the 90% confidence level?	No	No	Yes	No
Savings attributable to other programs (kWh)	290	610	173	131
Percentage change in EE program participation rate for HER participants	1%	32%	28%	28%

Source: Navigant analysis

Table 6-31. Estimates of Double-Counted Savings: Wave 6

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	104,985	104,985	104,985	104,985
Rate of participation, PY6 (%)	1.16%	0.10%	0.03%	0.03%
Change in rate of participation from pre-program year (%)	-0.28%	0.00%	-0.17%	-0.27%
# HER control households	31,497	31,497	31,497	31,497
Rate of participation, PY6 (%)	1.07%	0.09%	0.04%	0.03%
Change in rate of participation from pre-program year (%)	-0.29%	0.00%	-0.13%	-0.31%
DID/POD statistic	0.01%	0.00%	-0.04%	0.04%
Change in program participation due to HER program	13	-2	-39	37
Statistically significant at the 90% confidence level?	No	No	No	No
Savings attributable to other programs (kWh)	7,490	-833	-10,264	22,141
Percentage change in EE program participation rate for HER participants	1%	-2%	-57%	-2832%

Source: Navigant analysis

Table 6-32. Estimates of Double-Counted Savings: Wave 7 Low

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	629,987	629,987	629,987	629,987
Rate of participation, PY6 (%)	1.00%	0.09%	0.14%	0.02%
Change in rate of participation from pre-program year (%)	-0.05%	0.03%	-0.10%	-0.26%
# HER control households	52,500	52,500	52,500	52,500
Rate of participation, PY6 (%)	0.98%	0.07%	0.14%	0.02%
Change in rate of participation from pre-program year (%)	-0.08%	0.03%	-0.10%	-0.24%
DID/POD statistic	0.02%	0.00%	0.00%	-0.02%
Change in program participation due to HER program	153	-26	-3	-119
Statistically significant at the 90% confidence level?	Yes	No	No	No
Savings attributable to other programs (kWh)	90,570	-12,998	-786	-70,621
Percentage change in EE program participation rate for HER participants	2%	-5%	0%	-44%

Source: Navigant analysis

Table 6-33. Estimates of Double-Counted Savings: Wave 7 High

	Program			
	FFR	HEA	MESP	Rebate
Average program savings (annual kWh per participant)	592	500	261	593
# HER treatment households	629,989	629,989	629,989	629,989
Rate of participation, PY6 (%)	1.30%	0.11%	0.04%	0.04%
Change in rate of participation from pre-program year (%)	0.01%	0.03%	-0.07%	-0.41%
# HER control households	52,499	52,499	52,499	52,499
Rate of participation, PY6 (%)	1.23%	0.10%	0.04%	0.03%
Change in rate of participation from pre-program year (%)	-0.09%	0.03%	-0.06%	-0.45%
DID/POD statistic	0.10%	0.01%	0.00%	0.04%
Change in program participation due to HER program	614	38	-25	234
Statistically significant at the 90% confidence level?	Yes	No	No	No
Savings attributable to other programs (kWh)	363,489	19,000	-6,522	138,835
Percentage change in EE program participation rate for HER participants	8%	6%	-9%	-7789%

Source: Navigant analysis

6.4.2 Legacy Uplift

In PY4, Navigant considered double-counted savings for the following PY4 programs: FFRR, the CACES, and the SFHP programs.[17] The measure lives for PY4 programs are taken from the PY4 total resource cost report.[18] Table 6-34 shows the double counted savings (kWh) from each program in PY4. According to the PY4 evaluation report, none of the Wave 2 participant or control customers participated in any of these other EE programs, and so there is no uplift for Wave 2.

Table 6-34. Double Counted Savings (kWh) from PY4

	FFRR	CACES - DTUP	CACES - SEER 13	CACES - SEER 14+	SFHP
Measure Life	8	5	5	5	9
Wave 1, Group 1	36,842	-463	-2,026	-1,431	166
Wave 1, Group 2	5,293	1,596	712	-658	-2,598
Wave 1, Group 3	20,173	-884	-467	-41	248
Wave 2	0	0	0	0	0
Wave 3	267,281	22,411	-19,818	-8,975	33,467
Wave 4	2,620	212	-732	0	1,443
Total	332,209	22,872	-22,331	-11,105	32,726

Source: Navigant analysis

In PY5, Navigant considered double-counted savings for the following PY5 programs: FFRR, the CSR, the CW, the MF, and the SFHES programs. The measure lives for PY5 programs are taken from the PY5 total resource cost report.[19] The measure life for the SFHES program is a simple average of the three measures included in that program. Table 6-35 shows the double counted savings (kWh) from each program in PY5.

[17] Navigant Consulting, Inc. 2013. *Energy Efficiency / Demand Response Plan: Plan Year 4 (6/1/2011-5/31/2012); Evaluation Report: Home Energy Reports*. Presented to Commonwealth Edison Company.
[18] Navigant Consulting, Inc. 2014. *Review of EPY4 Total Resource Cost Test Assumptions.* Presented to Commonwealth Edison Company.
[19] Navigant Consulting, Inc. 2014. *Review of EPY5 Total Resource Cost Test Assumptions.* Presented to Commonwealth Edison Company.

Table 6-35. Double Counted Savings (kWh) from PY5

	FFRR	CSR	CW	MF	SFHES
Measure Life	8	18	14	5.42	12
Wave 1, CR	63,249	39,118	4,010	368	-3,960
Wave 1, LR	-2,297	-4,835	689	643	2,103
Wave 2	592	-769	-262	1,858	0
Wave 3, CR	123,088	113,512	2,260	-4,650	23,881
Wave 3, LR	-16,106	-26,847	-753	3,717	2,255
Wave 4	4,717	-2,977	-2,786	386	-1,815
Wave 5, Non-AMI	-22,101	7,904	947	-2,915	1,804
Total	151,142	125,106	4,105	-593	24,268

Source: Navigant analysis

In PY6, Navigant considered double-counted savings for the following PY6 programs: SFHES, CSR, FFRR programs, and MCEEP. The PY6 total resource cost report is not yet available, so the program measure lives for PY6 are not included, but for the PY7 legacy uplift adjustment we make the reasonable assumption that each of these programs has a measure life of at least two years and thus should be deducted in PY7. Table 6-36 shows the double counted savings (kWh) from each program in PY6.

Table 6-36. Double Counted Savings (kWh) from PY6

	SFHES	CSR	FFRR	MCEE
Measure Life	-	-	-	-
Wave 1, CR	-1,229	-713	979	-2,195
Wave 1, LR	2,882	2,579	2,334	-340
Wave 1, TR	2,403	-1,993	9,753	-1,142
Wave 2	500	6	-9,463	274
Wave 3, CR	16,467	-27,912	15,414	-6,069
Wave 3, LR	2,099	-1,669	8,423	163
Wave 3, TR	-397	2,528	1,230	165
Wave 4	1,515	-9,967	-3,639	1,637
Wave 5, AMI	2,178	20,384	60,389	-5,418
Wave 5, Non-AMI CR	1,105	6,180	14,743	-1,951
Wave 5, Non-AMI TR	-892	-1,976	-12,148	-1,639
W6	14,987	59,750	16,937	3,435
Total	41,618	47,197	104,952	-13,080

Source: Navigant analysis