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ComEd
Citizens Utility Board Energy Saver Program Evaluation Report

FINAL
Energy Efficiency / Demand Response Plan:
Plan Year 8 (PY8)
(6/1/2015-5/31/2016)

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Commonwealth Edison Company

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Prepared by:

Carly Olig   **Daniel Layton**
Navigant   **Navigant**

www.navigant.com

Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606

Contact:

Randy Gunn, Managing Director	Jeff Erickson, Director	Josh Arnold, Associate Director
312.583.5714	608.497.2322	608.497.2328
Randy.Gunn@Navigant.com	Jeff.Erickson@Navigant.com	Josh.Arnold@Navigant.com

Citizens Utility Board Energy Saver Program Evaluation Report

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E. EXECUTIVE SUMMARY

This report presents a summary of the findings and results from the impact evaluation of the PY8[1] Citizens Utility Board Energy Saver (CUB-ES) program. The CUB-ES program is a third-party behavioral energy efficiency (EE) program being implemented under the Illinois Power Agency (IPA) funding mechanism.[2] CUB-ES is a free online rewards program that encourages residential households to save energy through a combination of information, incentives, and community engagement. The program leverages behavioral and marketing best practices by encouraging opt-in web engagement and rewarding customers who save energy. The program was first launched in June 2010, during ComEd PY3. In PY8, 3,046 new participants enrolled in the program.[3] New enrollment in PY8 was higher than enrollment in any previous year.

E.1. Program Savings

Table E-1 summarizes the PY8 electricity savings from the CUB-ES program. PY8 verified savings prior to uplift were 2,317 MWh. After adjusting for uplift from other energy efficiency programs (see Section 2.4), final verified savings were 2,169 MWh. The evaluation team calculated savings using regression analysis of monthly billing data comparing participants to a matched set of nonparticipants. As discussed in Section 4, this type of analysis estimates net savings and no further net-to-gross (NTG) adjustment is necessary.

Table E-1. PY8 Total Program Electric Savings

Savings Category	Energy Savings (MWh)
Implementer Estimated Savings †	-
Verified Net Savings, Prior to Uplift Adjustment	2,317
Final Verified Savings	2,169
Realization Rate †	-

Source: ComEd tracking data and Navigant team analysis.

† Navigant did not receive implementer estimated savings for this program and as such was not able to calculate a realization rate.

E.2. Program Savings by Wave

For the purposes of this report, Navigant characterized CUB-ES participants as comprising six waves that used rolling enrollment to acquire customers. These six waves correspond to program years since the CUB-ES program launched; thus the earliest wave, Wave PY3, began enrollment at the beginning of PY3 in June 2009 and the latest wave, Wave PY8, began enrollment at the beginning of PY8 in June 2015.[4]

Table E-2 summarizes estimated program savings by wave. In this table, the number of PY8 participants, in the first row, represents the number of customers in each wave with an active account of the first day of PY8, while the sample sizes, in the second and third rows, indicate the number of customers with sufficient data for inclusion in the regression analysis. Navigant estimated separate savings for each

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[1] The PY8 program year began June 1, 2015 and ended May 31, 2016.
[2] Created by Illinois Public Acts 97-0616 ("PA 97-0616") and 97-0824 ("PA 97-0824").
[3] For the purposes of this evaluation, Navigant defined participants as customers who created an account on the CUB-ES website and linked that account to their ComEd account.
[4] The wave assignment is primarily based on when customers linked their CUB-ES account to their ComEd account and thus began seeing personalized data on the web portal. However, the link date only started being recorded in August 2014, therefore any participant with a link date of August 19, 2014 is assigned to a wave based on their signup date for the program instead.

wave using regression analysis as described in Section 2.3. The weighted average per customer savings estimate was 3.24 percent (268.84 kWh).

Table E-2. PY8 CUB-ES Program Results by Wave

Type of Statistic	PY3 Wave	PY4 Wave	PY5 Wave	PY6 Wave	PY7 Wave	PY8 Wave	Total
Number of PY8 Participants	2,350	2,411	504	88	1,087	3,046	9,486
Sample Size – Treatment	2,227	2,315	441	72	990	2,589	8,634
Sample Size – Unique Matched Control	2,102	2,169	409	68	934	2,462	8,144
Percentage Savings	3.01%	5.42%	2.03%	1.00%	3.47%	1.86%	3.24%
Standard Error	*0.96%*	*0.92%*	*2.00%*	*3.26%*	*1.20%*	*0.79%*	*-*
Annualized Savings Per Customer, kWh	268.54	462.34	166.46	86.89	287.25	131.54	268.84
Standard Error	*85.43*	*78.77*	*164.22*	*283.60*	*99.68*	*55.77*	*-*
Verified Net Savings, Prior to Uplift Adjustment, MWh †	617	1,088	82	8	303	220	2,317
Standard Error	*196*	*185*	*81*	*25*	*105*	*93*	*-*
PY8 Uplift Adjustment, MWh ‡	26	17	2	3	7	29	83
Legacy Uplift Adjustment, MWh ‡	24	24	5	1	11	-	65
Final Verified Net Savings, MWh §	567	1,048	75	4	285	191	2,169

Source: ComEd tracking data and Navigant team analysis.
† Total savings are pro-rated for participants that closed their accounts during PY8.
‡ No adjustment was made to total savings for negative uplift, i.e. cases where the CUB-ES program decreased participation in other programs.
§ Final Verified Net Savings are equal to Verified Net Savings, Prior to Uplift Adjustment less the uplift of savings in other EE programs.

E.3.   Findings and Recommendations

The following includes program findings and recommendations.[5] In PY8, there were approximately 9,500 participants in the CUB-ES program, approximately one-third of whom joined the program in PY8. Total verified savings for PY8 were 2,317 MWh prior to uplift and 2,169 MWh after the uplift adjustment.

Finding 1. In PY8, the average percent savings per participant was 3.24 percent (268.84 kWh/year). Savings in PY8 were higher than in PY7, but lower than in PY6 and PY5.[6] During an interview, the implementation contractor indicated that they had made changes to the program website during PY8, which may have contributed to the increase in savings.

Finding 2. Savings for older waves are not significantly lower than, and in some cases are actually higher than, savings for newer waves. The fact that savings from older waves remain relatively high indicates either that customers continue to engage with the program or that the program causes lasting savings that continue beyond engagement with the program.[7] The PY8 Wave had the lowest savings of the statistically significant waves, this may be because the savings ramp-up over time or because the PY8 Wave had somewhat lower baseline usage than the other waves.

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[5] 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] This program was first evaluated in PY5.
[7] Navigant is unable to distinguish between these two outcomes as there is no way to identify customers who did and did not engage with the program in PY8.

Recommendation 1. The program implementer should track which participants engaged with the program and which did not in a given program year, for example through web site log-ins, and share this information with ComEd in order to examine whether customers who engage with the program have higher savings than those who do not.

Finding 3. Participant enrollment increased significantly in PY8. Specifically, many customers who had previously created an account on the program website but had not linked it to their ComEd account took this final step. The program implementer indicated that they were making a concerted effort to reach these customers and it appears to have been successful.

Recommendation 2. The program implementer should continue to encourage customers who have created a CUB-ES account but not yet linked it to their ComEd account to do so. Additionally, the program implementer should consider efforts to make it easier for participants to link their accounts, for example allowing customers to link with their name or address, rather than an account number. These efforts need to be balanced with concerns regarding data privacy.

Finding 4. As indicated in previous evaluation reports, customer self-selection into the program continues to be a concern, which could bias estimated savings.

Recommendation 3. If concern over potential self-selection bias persists, ComEd, in conjunction with the program implementer and Navigant, should instead design a brief survey to be administered to new enrollees when they join the program asking when and how the new participant heard about the program and why they decided to join. Such survey results would allow for examination of reasons why customers join the program, which could shed light on possible self-selection bias.

1. INTRODUCTION

1.1 Program Description

The PY8[8] Citizens Utility Board Energy Saver (CUB-ES) program is a third-party behavioral energy efficiency (EE) program being implemented under the Illinois Power Agency (IPA) funding mechanism.[9] CUB-ES is a free online rewards program that encourages residential households to save energy through a combination of information, incentives and community engagement. The program leverages behavioral and marketing best practices by encouraging opt-in web engagement and rewarding customers who save energy. The program was first launched in ComEd PY3 (June 2010).

Figure 1-1 shows new enrollment in each program year since the program launch.[10] In PY8, there were a total of 6,440 participants with active ComEd accounts enrolled at the start of the program year and 9,486 participants enrolled at the end of the program year,[11] making new enrollment in PY8 3,046 customers.[12] The program implementer reported making a concerted effort in PY8 to enroll customers who had previous joined the CUB-ES website but had not yet linked their ComEd account. These numbers appear to indicate that this effort was successful as PY8 had the highest annual enrollment of any year since the program began.

Figure 1-1. CUB-ES Annual Enrollment, PY3 – PY8
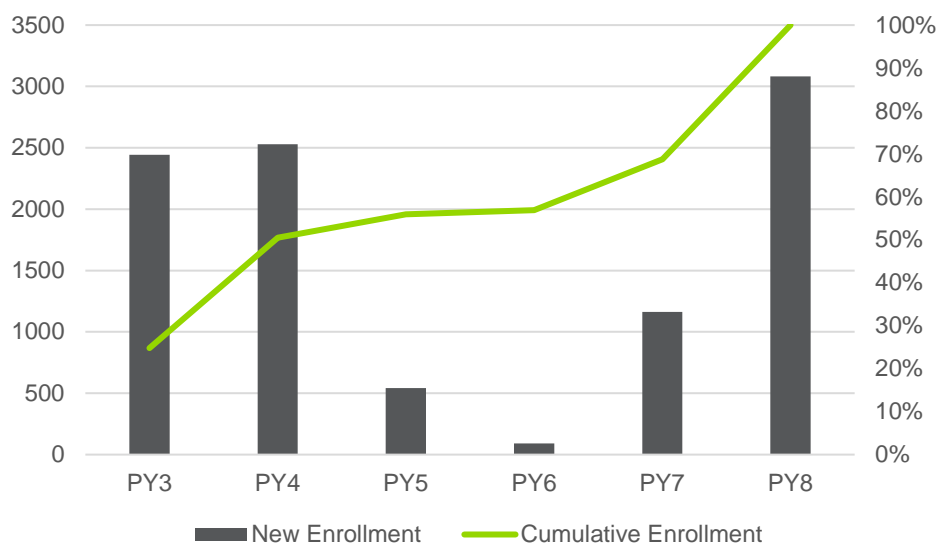
Source: ComEd tracking data and Navigant team analysis.

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[8] The PY8 program year began June 1, 2015 and ended May 31, 2016.

[9] Created by Illinois Public Acts 97-0616 ("PA 97-0616") and 97-0824 ("PA 97-0824").

[10] Figure 1-1 includes all participants from each program year including those who did not have an active account with ComEd during PY8.

[11] This is lower than the number included in the early data characterization memo because it excludes participates who joined the program prior to June 2010 who were identified as test users by the program implementer. See memo "ComEd PY8 CUB Energy Savers Program – Early Data Characterization" delivered to ComEd on September 7, 2016.

[12] For the purposes of this evaluation, Navigant defined participants as customers who created an account on the CUB-ES website and linked that account to their ComEd account. Using this definition ensured that the evaluation picked up the impact of the full CUB-ES experience including viewing personalized information. Any effect of the program that came from someone signing up for the CUB-ES website but not linking to a ComEd account was not captured.

For the purposes of this report, Navigant characterized CUB-ES participants as comprising six waves that used rolling enrollment to acquire customers. These six waves correspond to program years since the CUB-ES program launched; thus the earliest wave, Wave PY3, began enrollment at the beginning of PY3 in June 2010 and the latest wave, Wave PY8, began enrollment at the beginning of PY8 in June 2015. [13]

Figure 1-2 provides a graphical depiction of average daily usage in PY8 for each wave. Daily electricity usage varied across the different waves from 24 kWh per day for the PY5 Wave to about 30 kWh per day for the PY3 Wave.

Figure 1-2. PY8 Average Daily Usage by Wave
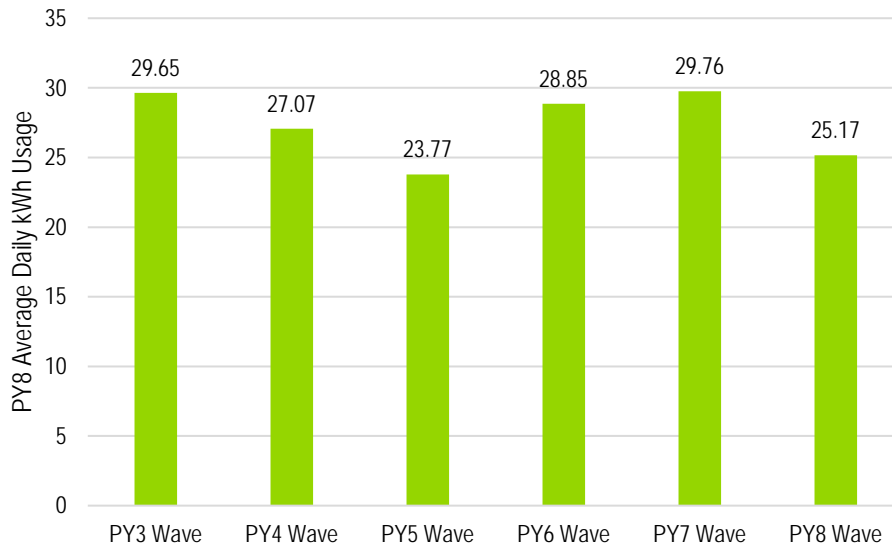
Source: ComEd data and Navigant team analysis.

1.2 Evaluation Objectives

The objective of this evaluation was to determine the PY8 energy savings generated by the CUB-ES program.

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[13] The wave assignment is primarily based on when customers linked their CUB-ES account to their ComEd account and thus began seeing personalized data on the web portal. However, the link date only started being recorded in August 2014, therefore any participant with a link date of August 19, 2014 is assigned to a wave based on their signup date for the program instead.

2. EVALUATION APPROACH

The evaluation approach in PY8 was consistent with that of the evaluations in previous years, relying on statistical analysis appropriate for opt-in behavioral programs. Navigant used matching methods to create a matched control group and then estimated program impacts using a regression with pre-program matching (RPPM) analysis with lagged controls for pre-period energy usage.

2.1 Overview of Data Collection Activities

The core data collection activities included receiving billing and tracking data for the CUB-ES program, receiving tracking data for the other programs used in the uplift analysis, and conducting interviews with program staff. The full set of data collection activities is shown in Table 2-1.

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	Completes Achieved	When
CUB-ES Program Tracking Database	Participants and Potential Controls	-	-	May 2016
CUB-ES Program Billing Database	Participants and Potential Controls	-	-	January 2008 – May 2016
Other Program Tracking Database	Participants and Potential Controls	-	-	June 2009 – May 2016
In Depth Interviews	Program Manager/Implementer Staff	1	1	July 2016

2.2 Data Used in Impact Analysis

In preparation for the impact analysis, Navigant combined and cleaned data provided by the program implementer. The dataset included 10,247 participants in the CUB-ES program and a large pool of non-participants. Billing data used in the analysis extended from January 2008 (29 months before the start of the program) to May 2016. Data during the twelve month pre-period for each participant and during PY8 was used in the regression analysis described in Section 2.3.

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

- Participants who enrolled prior to June 2010.[14]
- Participants who did not have an active account on the first day of PY8.
- Observations where billing duration was zero.
- Observations with missing or negative usage.
- Observations with less than 20 and 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.[15]
- Customers with fewer than 8 bills in the matching period.

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

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[14] Customers who enrolled prior to June 2010 were identified by the program implementer as test users. Data was received for 262 such participants.
[15] The median usage for participants was 18.7 kWh per day; observations with usage values greater than 187 kWh per day or less than 1.87 kWh per day were excluded from the analysis.

2.3 Statistical Approach used in the Impact Evaluation

To estimate energy savings, Navigant used the RPPM approach described in Ho, Imai, King, and Stuart (2007).[16] Using the RPPM method, Navigant has successfully evaluated many opt-in behavioral programs. Additional detail about the statistical approach used in this evaluation is described in Section 6.2.1.

2.3.1 Matching Algorithm and Matching Results

Matching methods rely on a set of matched comparison households to estimate program savings. The pool of non-participant households available for matching consisted of approximately 266,000 ComEd residential customers. Additional detail about the matching methods used for this evaluation is included in Section 6.2.2.

For each program participant, energy consumption in the period spanning fourteen to three months before program enrollment (a 12 month period)[17] was compared to that of all customers in the available non-participant pool with billing data over the same twelve months. For the purpose of matching, program enrollment was when a participant signed up for the CUB-ES program, i.e., when they created an account on the CUB-ES website. However, participants were not able to see their own data on the website until they linked their CUB-ES account to their ComEd account. Thus, for this evaluation the treatment period started after a participant's account was linked. The period between the signup date and the link date was a blackout period which was considered neither pre-program nor post-program.[18] The non-participant with the most similar energy use to the participant during the 12-month matching period was used as that participant's match.[19]

It is not possible to statistically test for self-selection bias,[20] but Imbens and Wooldridge (2009) present a test that is suggestive (hereafter called the "IW test").[21] In the current context, the logic of the test is that in the absence of selection bias there should be no difference between participants and matches in average energy use outside of the matching period and outside of the program period. A simple implementation of the test is to determine whether, given matches based on fourteen to three months before program enrollment, the average difference in energy use between a participant and their match in the two months before program enrollment is practically or statistically different than zero.

Figure 2-1 presents the mean of average daily energy use by participants and their matches in the fourteen months before program enrollment, and Figure 2-2 amplifies differences between the two groups by presenting the average difference in energy use between participants and their matches in percentage terms, with 90 percent confidence intervals superimposed. The figures illustrate that on average, the energy use by matches was very similar to that of program participants. Mean differences in energy use were, as a whole, neither statistically nor practically different than zero, with only one month statistically different, during the twelve-month matching period and the three-month test period.

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[16] Ho, Daniel E., Kosuke Imai, Gary King, and Elizabeth Stuart. 2007. Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis* 15(3): 199-236.
[17] In order to draw a match, a CUB-ES participant had to have data in at least eight of the twelve months in the matching period.
[18] Using this definition of the pre and post-program periods ensured that the evaluation picked up the impact of the full CUB-ES experience including viewing personalized information. Any effect of the program that came from a participant signing up for the CUB-ES website but not linking to a ComEd account was not captured.
[19] For most of the CUB-ES participants who enrolled prior to the start of PY8, Navigant used the same matched controls as were selected for the PY7 evaluation. New matched controls were selected for participants whose match from PY7 became inactivate during PY8 and for all the participants who enrolled during PY8.
[20] Self-selection bias is bias due to the fact that customers who choose to join the program are different from those who do not in unobservable ways.
[21] Imbens, Guido W., and Jeffrey M. Wooldridge. 2009. "Recent Developments in the Econometrics of Program Evaluation." *Journal of Economic Literature*, 47(1): 5-86.

Figure 2-1. Average Energy Use Before Program Enrollment, CUB-ES Participants and Matched Controls
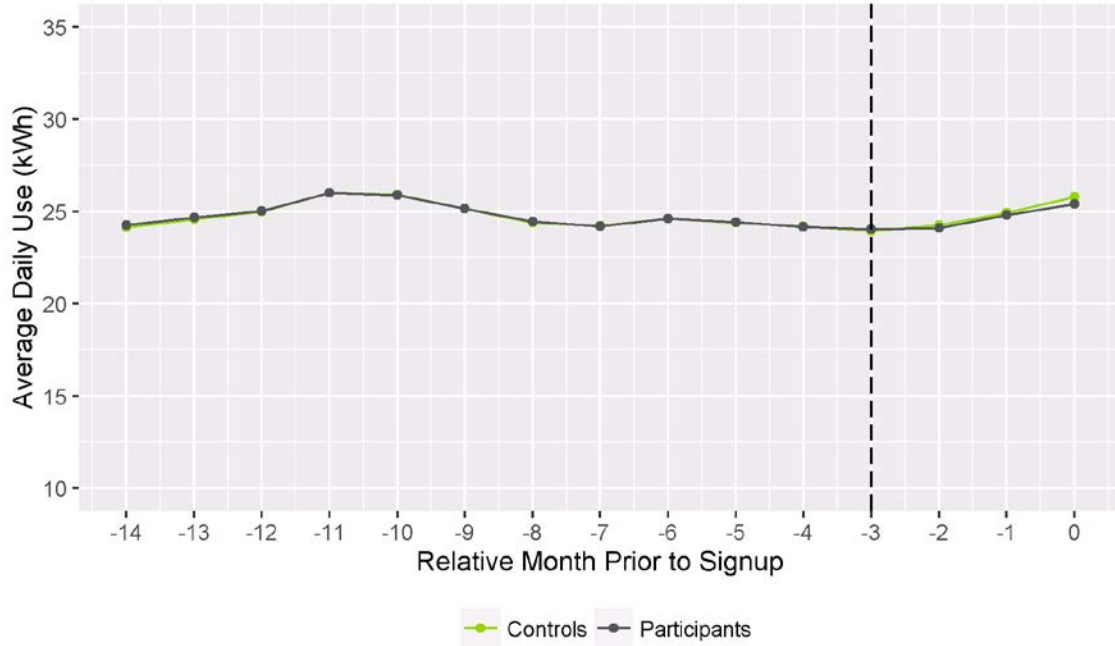
Source: ComEd tracking data and Navigant team analysis.

Figure 2-2. Average Percent Difference in Energy Use Before Program Enrollment, CUB-ES Participants and Matched Controls
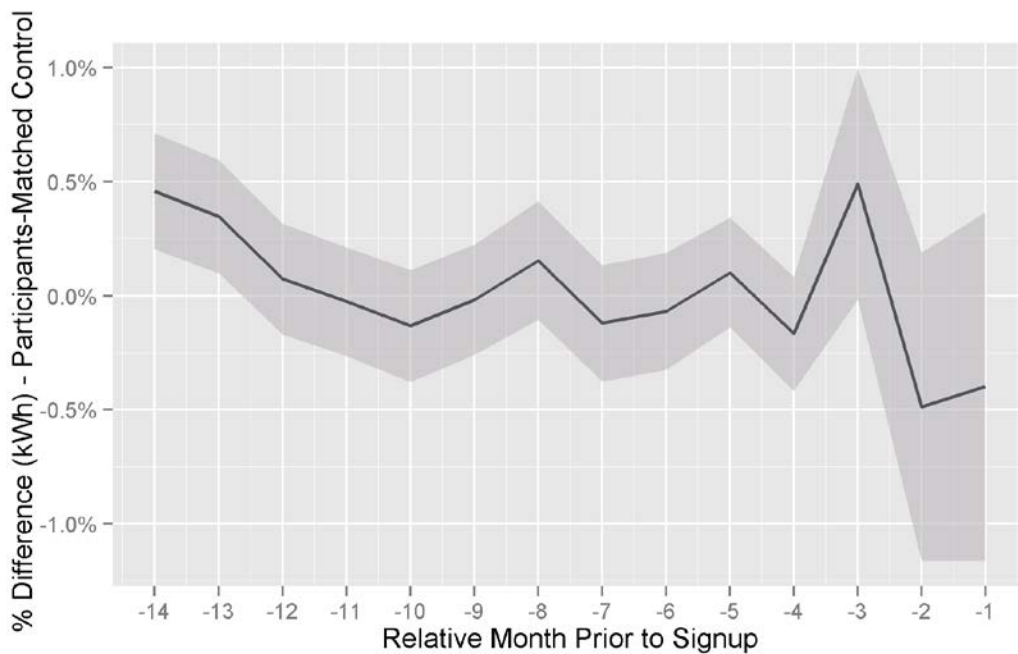
Source: ComEd tracking data and Navigant team analysis.

2.4 Accounting for Uplift in other Energy Efficiency Programs

2.4.1 Accounting for Uplift in PY8

If participation rates in other EE programs are the same for CUB-ES participants and their matched controls, the savings estimates from the regression analyses are already "net" of savings from other programs, as this indicates the CUB-ES program does not increase or decrease participation in other EE programs. However, if the CUB-ES 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 CUB-ES and EE programs. For instance, if the CUB-ES program increases participation in other EE programs, the increase in savings may be allocated to either the CUB-ES program or the EE program, but cannot be allocated to both programs simultaneously.[22] Note that when the CUB-ES program decreases participation in other programs there is no issue of double-counting and thus no adjustment to the savings total is made.

Data permitting, Navigant uses a difference-in-difference (DID) statistic to estimate uplift in other EE programs. To calculate the DID statistic, the change in the participation rate in another EE program between PY8 and the pre-program year for the matched control group is subtracted from the same change for the treatment group. For instance, if the rate of participation in an EE program during PY8 is five percent for the treatment group and three percent for the matched control group, and the rate of participation during the year before the start of the program is two percent for the treatment group and one percent for the matched control group, then the rate of uplift due to the CUB-ES program is one percent, as reflected in Equation 2-1.

Equation 2-1. DID Statistic Calculation

$$(PY\ treatment\ group\ participation - prePY\ treatment\ group\ participation)$$
$$- (PY\ control\ group\ participation - prePY\ control\ group\ participation)$$
$$= DID\ statistic$$
$$(5\% - 2\%) - (3\% - 1\%) = 1\%$$

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

An alternative to the DID statistic is the post-only difference (POD) statistic, which is the simple difference in participation rates between the treatment and matched control groups during PY8. The POD statistic generates an unbiased estimate of uplift when the baseline average rate of participation in the EE program is the same for the two groups. Navigant uses this alternative 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 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 CFLs and low-flow showerheads. The Rebate program 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.

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[22] It is not possible to avoid double counting of savings generated by programs for which tracking data are not available, such as upstream lighting programs.

For each EE program, double-counted savings were calculated separately for each program year wave of the CUB-ES program.

2.4.2 Accounting for Legacy Uplift

The uplift adjustment methodology described in Section 2.4 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 life.[23] However, for other EE programs with measures with multiple-year measure lives, CUB-ES 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 CUB-ES program savings not just in PY2, but in PY3 through PY11 as well.

Consider the following example. A household in the CUB-ES program enrolls in the FFR program in PY6. The uplift adjustment subtracts FFR PY6 program savings to avoid double counting. In PY7 this household still receives savings from the FFR program because it has an eight-year measure life. However, the PY7 CUB-ES uplift adjustment does not remove these savings because the PY7 adjustment only accounts for measures installed in PY7, the initial year that the household entered a program. Thus, when only relying on the uplift adjustment described in Section 2.4.1, FFR second year savings would be included in the PY7 CUB-ES program's savings, which is inconsistent with Illinois's practice of only crediting utilities with first-year EE program savings. Legacy uplift removes double counted energy savings from programs with measures with a multiple-year measure life.

Navigant accounts for legacy uplift by subtracting the double counted savings from previous years, adjusted for the average annual move-out rate, from PY8 CUB-ES savings through the measure lives of other EE programs.[24] The legacy uplift adjustment is shown in Equation 2-2.

Equation 2-2. Legacy Uplift Calculation

$$\text{CUB-ES Savings}_{\text{PY}}^{\text{Adjusted}} = \text{CUB-ES Savings}_{\text{PY}}^{\text{Unadjusted}} - \text{Uplift Savings}_{\text{PY}} - \sum_{i=1}^{\text{PY-1}} \text{"Live" Legacy Uplift Savings}_i \cdot$$

$$(1 - \text{MOR})^{\text{PY - i}}$$

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 PY5 when Navigant first evaluated the CUB-ES program. In PY5, Navigant considered double-counted savings for the Fridge Freezer Recycle Rewards (FFRR), the Complete System Replacement (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. In PY7 Navigant considered double-counted savings for the same four programs as PY8: the FFR program, the HEA program, the Rebate program, and MESP.

2.5 Process Evaluation

The PY8 CUB-ES program evaluation did not include a process evaluation.

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[23] 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.
[24] Since CUB-ES program participants are dropped from that program when they move, other EE programs' savings are no longer captured in the CUB-ES program savings from that point forward.

3. GROSS IMPACT EVALUATION

Total program savings are summarized in Table 3-1 below. Verified savings, prior to uplift, were 2,317 MWh. Of that total, 83 MWh was due to PY8 uplift in other EE programs and 65 MWh was due to legacy uplift, resulting in final verified savings of 2,169 MWh for PY8.

Table 3-1. PY8 Total Program Electric Savings

Savings Category	Energy Savings (MWh)
Implementer Estimated Savings †	-
Verified Net Savings, Prior to Uplift Adjustment	2,317
Final Verified Savings	2,169
Realization Rate †	-

Source: ComEd tracking data and Navigant team analysis.

† Navigant did not receive implementer estimated savings for this program and as such was not able to calculate a realization rate.

3.1 Uplift of Savings in Other EE Programs

RPPM program savings estimates include savings resulting from the uplift in participation in other EE programs caused by the CUB-ES program. To avoid double-counting savings, program savings due to this uplift must be counted towards either the CUB-ES program or the other EE programs, but not both programs. The uplift of savings in other EE programs was 148 MWh, or 6.4 percent of total program savings. The uplift can be broken down into uplift in PY8 and legacy uplift from previous program years. The PY8 uplift was 83 MWh or 3.6 percent of total program savings and the legacy uplift was 65 MWh or 2.8 percent of total program savings. Table 3-2 shows how the uplift adjustment affects total savings.

Table 3-2. PY8 Uplift Adjustment

Savings Category	Energy Savings (MWh)
Verified Net Savings, Prior to Uplift Adjustment	2,317
PY8 Uplift Adjustment	83
Legacy Uplift Adjustment	65
Final Verified Net Savings	*2,169*

Source: ComEd data and Navigant team analysis.

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

Subtracting the savings uplift from total savings (2,317 MWh) generates a final savings estimate of 2,169 MWh. To put this in perspective, across the two waves the weighted average percentage savings for PY8 due to the CUB-ES program was 3.24 percent, and removing the savings uplift in other EE programs reduces this value to 3.03 percent.[25]

Section 6.4 in the appendix presents the details of the calculation of the PY8 and Legacy uplift for each of the four ComEd EE programs considered in the analysis. As previously mentioned, the programs

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[25] Multiplying 3.24 percent (the percentage of total energy use saved) by 6.4 percent (the percentage of total savings uplift in other EE programs) generates the value 0.21 percent. Formally, as shown in the following calculation: $0.0324 \times 0.064 = 0.00206$. Subtracting this value from 0.0324 gives 0.0303, or 3.03 percent.

included in the uplift analysis in PY8 were the FFR program, the HEA program, the Rebate program and the MESP.[26]

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 PY8. Under the more reasonable assumption that participation occurs at a uniform rate throughout the year, the estimate of double-counted savings would be approximately 74 MWh, half the estimated value of 148 MWh. Overall, double counting of savings with other ComEd EE programs is larger for this program than for some of ComEd's other behavioral programs. This indicates that the CUB-ES program is doing a relatively good job of channeling participants into other ComEd EE programs.

3.2 Verified Program Impact Results

Table 3-3 summarizes estimated program savings by wave. In this table, the number of PY8 participants, in the first row, represents the number of customers in each wave in PY8, while the sample sizes, in the second and third rows, indicate the number of customers with sufficient data for inclusion in the regression analysis. Navigant estimated separate savings for each wave using regression analysis as described in Section 2.3. The weighted average per customer savings estimate was 3.24 percent (268.84 kWh). Detailed parameter estimates from the RPPM model are shown in Section 6.3.

Table 3-3. PY8 CUB-ES Program Results by Wave

Type of Statistic	PY3 Wave	PY4 Wave	PY5 Wave	PY6 Wave	PY7 Wave	PY8 Wave	Total
Number of PY8 Participants	2,350	2,411	504	88	1,087	3,046	9,486
Sample Size - Treatment	2,227	2,315	441	72	990	2,589	8,634
Sample Size – Unique Matched Control	2,102	2,169	409	68	934	2,462	8,144
Percentage Savings	3.01%	5.42%	2.03%	1.00%	3.47%	1.86%	3.24%
Standard Error	*0.96%*	*0.92%*	*2.00%*	*3.26%*	*1.20%*	*0.79%*	*-*
Annualized Savings Per Customer, kWh	268.54	462.34	166.46	86.89	287.25	131.54	268.84
Standard Error	*85.43*	*78.77*	*164.22*	*283.60*	*99.68*	*55.77*	*-*
Verified Net Savings, Prior to Uplift Adjustment, MWh †	617	1,088	82	8	303	220	2,317
Standard Error	*196*	*185*	*81*	*25*	*105*	*93*	*-*
PY8 Uplift Adjustment, MWh ‡	26	17	2	3	7	29	83
Legacy Uplift Adjustment, MWh ‡	24	24	5	1	11	-	65
Final Verified Net Savings, MWh §	567	1,048	75	4	285	191	2,169

Source: ComEd tracking data and Navigant team analysis.
† Total savings are pro-rated for participants that closed their accounts during PY8.
‡ No adjustment was made to total savings for negative uplift, i.e. cases where the CUB-ES program decreased participation in other programs.
§ Final Verified Net Savings are equal to Verified Net Savings, Prior to Uplift Adjustment less the uplift of savings in other EE programs.

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[26] 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 CUB-ES program is not possible due to the requirement in our evaluation that CUB-ES participants have sufficient historical usage data.

Figure 3-1 shows the energy savings for each wave with the 90 percent confidence interval. The PY5 and PY6 Waves were too small, with sample sizes of 441 and 72 participants respectively, to produce statistically significant estimates of savings. Savings for the older program year waves are not significantly lower than, and in some cases are actually higher than, savings for the newer waves. The fact that savings from the older waves remain relatively high indicates either that customers continue to engage with the program or that the program causes lasting savings that continue beyond engagement with the program.[27] The PY8 Wave had the lowest savings of the statistically significant waves, this may be because the savings ramp-up over time or because the PY8 Wave had somewhat lower baseline usage than the other waves.

Figure 3-1. PY8 Percent Savings and 90 Percent Confidence Interval, by Wave
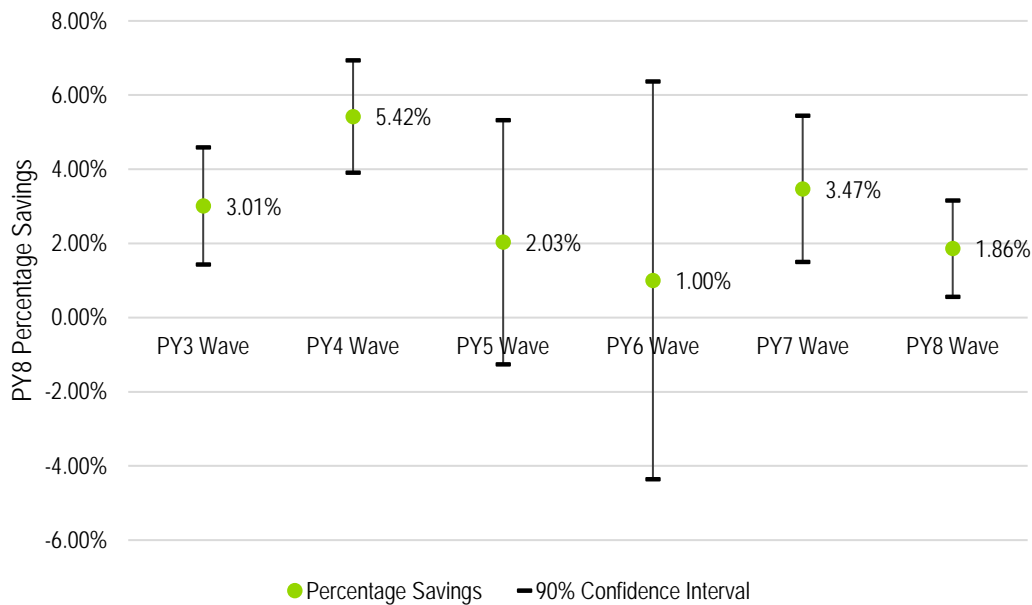
Source: *ComEd tracking data and Navigant team analysis.*

Figure 3-2 combines PY8 results with those from previous years to show how the estimated percentage savings average over time has changed over multiple program years. Program savings rose in PY8 after dropping during PY6 and PY7 but have yet to return to levels initially estimated from PY5. During an interview with the implementation contractor they indicated that they had made substantial changes to the program website during PY8 which may have led to the increased PY8 savings.

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[27] Navigant is unable to distinguish between these two outcomes as there is no way to identify customers who did and did not engage with the program in PY8.

Figure 3-2. CUB-ES Program Savings Over Time
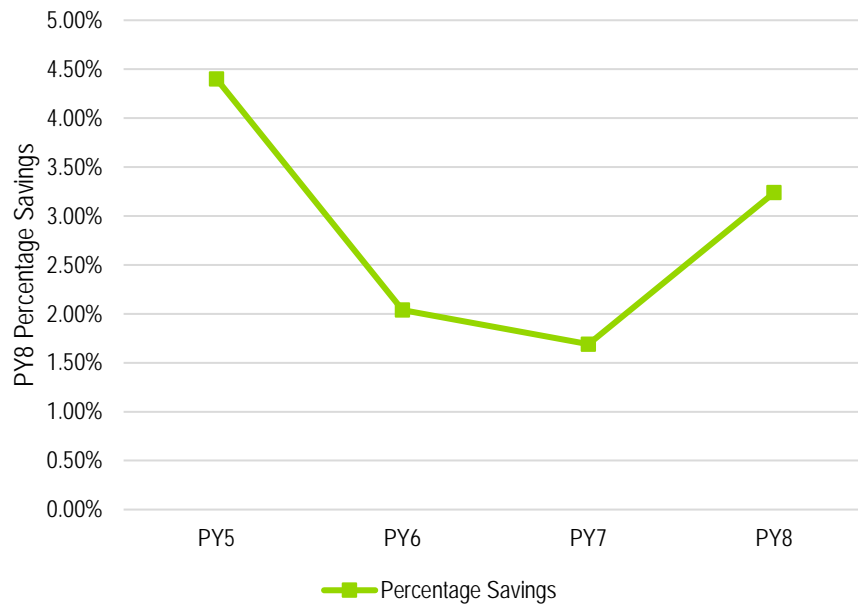
Source: ComEd tracking data and Navigant team analysis.

4. NET IMPACT EVALUATION

A key feature of the matched control group method used to estimate savings for the CUB-ES program is that the analysis assumes that with respect to unobserved variables that may affect program savings, on average program enrollees are no different than customers matched to them. In other words, in the absence of the program the expectation is that participants in the CUB-ES program and their matched controls would have exhibited the same energy usage. In particular, in the absence of the program the expectation is that participants and matched controls would exhibit the same degree of energy-conserving behavior and purchases. Therefore, this method estimates net savings and no further NTG adjustment is necessary.

5. FINDINGS AND RECOMMENDATIONS

The following includes program findings and recommendations.[28] In PY8, there were approximately 9,500 participants in the CUB-ES program, approximately one-third of whom joined the program in PY8. Total verified savings for PY8 were 2,317 MWh prior to uplift and 2,169 MWh after the uplift adjustment.

Finding 1. In PY8, the average percent savings per participant was 3.24 percent (268.84 kWh/year). Savings in PY8 were higher than in PY7, but lower than in PY6 and PY5.[29] During an interview, the implementation contractor indicated that they had made changes to the program website during PY8, which may have contributed to the increase in savings.

Finding 2. Savings for older waves are not significantly lower than, and in some cases are actually higher than, savings for newer waves. The fact that savings from older waves remain relatively high indicates either that customers continue to engage with the program or that the program causes lasting savings that continue beyond engagement with the program.[30] The PY8 Wave had the lowest savings of the statistically significant waves, this may be because the savings ramp-up over time or because the PY8 Wave had somewhat lower baseline usage than the other waves.

Recommendation 1. The program implementer should track which participants engaged with the program and which did not in a given program year, for example through web site log-ins, and share this information with ComEd in order to examine whether customers who engage with the program have higher savings than those who do not.

Finding 3. Participant enrollment increased significantly in PY8. Specifically, many customers who had previously created an account on the program website but had not linked it to their ComEd account took this final step. The program implementer indicated that they were making a concerted effort to reach these customers and it appears to have been successful.

Recommendation 2. The program implementer should continue to encourage customers who have created a CUB-ES account but not yet linked it to their ComEd account to do so. Additionally, the program implementer should consider efforts to make it easier for participants to link their accounts, for example allowing customers to link with their name or address, rather than an account number. These efforts need to be balanced with concerns regarding data privacy.

Finding 4. As indicated in previous evaluation reports, customer self-selection into the program continues to be a concern, which could bias estimated savings.

Recommendation 3. If concern over potential self-selection bias persists, ComEd, in conjunction with the program implementer and Navigant, should instead design a brief survey to be administered to new enrollees when they join the program asking when and how the new participant heard about the program and why they decided to join. Such survey results would allow for examination of reasons why customers join the program, which could shed light on possible self-selection bias.

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[28] 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.

[29] This program was first evaluated in PY5.

[30] Navigant is unable to distinguish between these two outcomes as there is no way to identify customers who did and did not engage with the program in PY8.

6. APPENDIX

6.1 Detailed Data Cleaning

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

- Participants who enrolled prior to June 2010. [31]
- Participants who did not have an active account on the first day of PY8.
- Observations where billing duration was zero.
- Observations with missing or negative usage.
- Observations with less than 20 and 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. [32]
- Customers with fewer than 8 bills in the matching period.

Table 6-1 gives counts and percentages of customers and observations removed for each step.

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

Step	Customers	Observations	Customer % Change	Observation % Change
Raw Data	10,247	915,376		
Remove customers who enrolled during PY2 or moved prior to PY8	9,486	857,879	7.43%	6.28%
Bill duration does not equal 0	9,486	857,879	0%	0%
Bill Flattening	9,486	833,160	0%	2.88%
Remove duplicate bills	9,486	833,160	0%	0%
Exclude observations missing usage	9,486	833,160	0%	0%
Remove observations with negative usage	9,486	833,160	0%	0%
Exclude bills with long or short durations	9,486	831,540	0%	0.19%
Exclude outliers	9,482	825,224	0.04%	0.76%
Remove customers with fewer than eight months in the matching period	8,634	553,536	8.94%	32.92%

Source: ComEd data and Navigant team analysis.

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[31] Customers who enrolled prior to June 2010 were identified by the program implementer as test users. Data was received for 262 such participants.

[32] The median usage for participants was 18.7 kWh per day; observations with usage values greater than 187 kWh per day or less than 1.87 kWh per day were excluded from the analysis.

6.2 Detailed Impact Methodology

6.2.1 Regression with Pre-Program Matching Model (RPPM)

As discussed in Section 2.3, the basic logic of regression with a matching model is to balance the participant and non-participant samples by matching on the exogenous covariates known to have a high correlation with the outcome variable. Doing so increases the efficiency of the estimate and reduces the potential for model specification bias. Formally, the argument is that if the outcome variable Y is independently distributed conditional on X and D (conditional independence assumption), where X is a set of exogenous variables and D is the program variable, then the analyst can gain some power in the estimate of savings and reduce potential model specification bias by assuring that the distribution of X is the same for treatment and matched control observations.

In this evaluation, the outcome variable is monthly post-program period energy use, and the available exogenous covariate with by far the greatest correlation with this outcome variable is energy use in the same month of the pre-program period, $PREkWh_{kt}$, where k indexes the customer and t indexes the month; this is why the matching takes the form described in Section 2.3.1. The RPPM approach can be interpreted as using regression analysis to further control for any remaining imbalance in the matching on this variable. If, for instance, after matching the participants use slightly more energy on average in the pre-program period than their matches – in other words, they are higher baseline energy users – then including $PREkWh_{kt}$ as an explanatory variable in a regression model predicting monthly energy use during the post-program period prevents this remaining slight difference in baseline energy use from being attributed to the program.

In the RPPM approach the development of a matched comparison group is viewed as a useful pre-processing step in a regression analysis to assure that the distributions of the covariates (i.e., the explanatory variables on which the output variable depends) for the treatment group are the same as those for the comparison group that provides the baseline measure of the output variable.[33] This minimizes the possibility of model specification bias. The regression model is applied only to the post-treatment period, and the matching focuses on those variables expected to have the greatest impact on the output variable.

6.2.2 Matching Algorithm and Matching Results

As described in Section 2.3.1, participants and potential controls were matched on energy use during the pre-treatment period, and then estimated a model for all post-program observations in which energy use in month *t* is a function of a monthly fixed effect, a zip code level fixed effect, energy use in the same calendar month in the one-year period before program enrollment, and whether the customer is a program participant. Formally, the model is shown in Equation 6-1.

Equation 6-1. RPPM Model

$$ADU_{kt} = \beta_1 Treatment_k + \sum_J \beta_{2j} Month_{jt} + \sum_J \beta_{3j} Month_{jt} \cdot PREkWh_{kt} + \sum_L \beta_{4l} Zip_{kl} + \varepsilon_{kt}$$

Where,

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[33] Ho, Daniel E., Kosuke Imai, Gary King, and Elizabeth Stuart. 2007. Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis* 15(3): 199-236.

ADU_{kt}	=	Average daily energy use by household k in month t.
$Treatment_k$	=	A binary variable taking a value of 1 if customer k is a CUB-ES participant and 0 otherwise.
$Month_{jt}$	=	A binary variable taking a value of 1 when $j = t$ and 0 otherwise. [34]
$PREkWh_{kt}$	=	The average daily electricity use by household k during the most recent month before household k (or its match) enrolled in the CUB-ES program that is also the same calendar month as month t. For instance, if household k enrolled in August 2011, the value of $PREkWh_{kt}$ for June 2012 is June 2011.
Zip_{kl}	=	A binary variable taking a value of 1 if customer k is in zip code l and 0 otherwise.
ε_{kt}	=	Model error term.

In this model β_1 is the treatment effect. The monthly fixed effect is included to account for unobserved time-related factors, such as weather, that affect all customers, and interact the monthly dummy variable with $PREkWh_{kt}$ to account for the fact that the relationship between energy use in the year before enrollment and energy use in the program year might vary by calendar month. The zip code fixed effect is included to account for geographic factors, such as school quality, that affect all customers.

For the sake of expositional clarity below, let t_k denote the month t in which customer k enrolled in the program, with t_k -1 denoting the month before enrollment, t_k +1 denoting the month after enrollment, and so on. Customers with more than four missing bills during the designated matching period [t_k -14, t_k -3] were not matched.

The basis of the comparison is the difference in monthly energy use between a participant and a potential match, D_{PM} (**D**ifference between **P**articipant and potential **M**atch). The quality of a match is denoted by the Euclidean distance to the participant over the twelve values of monthly D_{PM} used for matching; that is, denoting by SSD the sum of squared D_{PM} over the matching period, it is denoted by SSD$^{1/2}$. The non-participant customer with the shortest Euclidean distance to a participant was chosen as the matched comparison for the participant. Matching was done with replacement.

6.3 Detailed Impact Results: Parameter Estimates

Parameter estimates for Equation 6-1 are presented in Table 6-2 through Table 6-7. Parameter Estimates for RPPM Model for PY8 Wave

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[34] 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.

Table 6-2. Parameter Estimates for RPPM Model for PY3 Wave

	Estimate	Std. Error	T value	P value
treatment	-0.73	0.23	-3.14	0.00
yrmo201506	6.19	0.40	15.51	0.00
yrmo201507	7.54	0.51	14.75	0.00
yrmo201508	10.59	0.52	20.42	0.00
yrmo201509	10.23	0.50	20.59	0.00
yrmo201510	6.30	0.40	15.83	0.00
yrmo201511	6.83	0.53	12.96	0.00
yrmo201512	6.96	0.60	11.63	0.00
yrmo201601	6.85	0.54	12.64	0.00
yrmo201602	6.86	0.51	13.45	0.00
yrmo201603	7.11	0.52	13.59	0.00
yrmo201604	5.26	0.43	12.16	0.00
yrmo201605	5.52	0.53	10.45	0.00
yrmo201506:pre_use	0.63	0.02	40.30	0.00
yrmo201507:pre_use	0.56	0.02	36.99	0.00
yrmo201508:pre_use	0.65	0.01	46.18	0.00
yrmo201509:pre_use	0.65	0.02	36.98	0.00
yrmo201510:pre_use	0.68	0.02	34.95	0.00
yrmo201511:pre_use	0.60	0.03	23.83	0.00
yrmo201512:pre_use	0.61	0.02	25.49	0.00
yrmo201601:pre_use	0.61	0.02	32.22	0.00
yrmo201602:pre_use	0.63	0.02	32.35	0.00
yrmo201603:pre_use	0.63	0.02	27.06	0.00
yrmo201604:pre_use	0.69	0.02	31.87	0.00
yrmo201605:pre_use	0.64	0.03	24.75	0.00

R-Squared: 0.87 Adj. R-Squared: .87

F-Statistic: 13,792.79 on 49,605 and 25 DF, p-value:0.00

Source: ComEd tracking data and Navigant team analysis.

Table 6-3. Parameter Estimates for RPPM Model for PY4 Wave

	Estimate	Std. Error	T value	P value
treatment	-1.26	0.22	-5.87	0.00
yrmo201506	3.49	0.37	9.55	0.00
yrmo201507	5.49	0.41	13.43	0.00
yrmo201508	6.15	0.41	14.99	0.00
yrmo201509	7.86	0.43	18.42	0.00
yrmo201510	6.32	0.48	13.04	0.00
yrmo201511	6.27	0.40	15.73	0.00
yrmo201512	6.94	0.47	14.81	0.00
yrmo201601	7.17	0.50	14.28	0.00
yrmo201602	5.94	0.50	11.94	0.00
yrmo201603	7.58	0.62	12.14	0.00
yrmo201604	4.94	0.34	14.55	0.00
yrmo201605	5.94	1.08	5.52	0.00
yrmo201506:pre_use	0.74	0.02	47.88	0.00
yrmo201507:pre_use	0.59	0.01	48.60	0.00
yrmo201508:pre_use	0.69	0.01	65.93	0.00
yrmo201509:pre_use	0.70	0.02	45.79	0.00
yrmo201510:pre_use	0.72	0.03	28.40	0.00
yrmo201511:pre_use	0.64	0.02	32.60	0.00
yrmo201512:pre_use	0.62	0.02	33.28	0.00
yrmo201601:pre_use	0.63	0.02	32.99	0.00
yrmo201602:pre_use	0.68	0.02	33.48	0.00
yrmo201603:pre_use	0.59	0.03	20.40	0.00
yrmo201604:pre_use	0.68	0.02	42.13	0.00
yrmo201605:pre_use	0.61	0.05	11.62	0.00

R-Squared: 0.89 Adj. R-Squared: .89

F-Statistic: 15,855.52 on 51,081 and 25 DF, p-value:0.00

Source: ComEd tracking data and Navigant team analysis.

Table 6-4. Parameter Estimates for RPPM Model for PY5 Wave

	Estimate	Std. Error	T value	P value
treatment	-0.45	0.45	-1.01	0.31
yrmo201506	1.90	0.55	3.48	0.00
yrmo201507	2.59	0.87	2.97	0.00
yrmo201508	5.24	0.94	5.59	0.00
yrmo201509	4.35	0.80	5.41	0.00
yrmo201510	4.76	0.81	5.85	0.00
yrmo201511	3.56	0.67	5.31	0.00
yrmo201512	3.60	1.12	3.21	0.00
yrmo201601	4.54	1.30	3.50	0.00
yrmo201602	3.59	1.09	3.29	0.00
yrmo201603	3.67	0.79	4.64	0.00
yrmo201604	1.76	1.95	0.90	0.37
yrmo201605	1.45	1.28	1.14	0.26
yrmo201506:pre_use	0.75	0.02	34.53	0.00
yrmo201507:pre_use	0.57	0.02	24.00	0.00
yrmo201508:pre_use	0.73	0.03	27.77	0.00
yrmo201509:pre_use	0.83	0.03	27.02	0.00
yrmo201510:pre_use	0.79	0.04	17.65	0.00
yrmo201511:pre_use	0.74	0.03	21.37	0.00
yrmo201512:pre_use	0.79	0.05	15.36	0.00
yrmo201601:pre_use	0.78	0.05	14.62	0.00
yrmo201602:pre_use	0.86	0.05	16.88	0.00
yrmo201603:pre_use	0.78	0.04	20.10	0.00
yrmo201604:pre_use	0.91	0.11	8.28	0.00
yrmo201605:pre_use	0.84	0.07	12.47	0.00

R-Squared: 0.90 Adj. R-Squared: .90

F-Statistic: 3,172.88 on 9,191 and 25 DF, p-value:0.00

Source: ComEd tracking data and Navigant team analysis.

Table 6-5. Parameter Estimates for RPPM Model for PY6 Wave

	Estimate	Std. Error	T value	P value
treatment	-0.24	0.77	-0.31	0.76
yrmo201506	5.40	1.95	2.77	0.01
yrmo201507	4.05	0.96	4.23	0.00
yrmo201508	7.25	1.54	4.70	0.00
yrmo201509	2.19	1.76	1.24	0.21
yrmo201510	3.03	1.15	2.64	0.01
yrmo201511	3.73	1.43	2.61	0.01
yrmo201512	3.88	1.39	2.80	0.01
yrmo201601	5.09	1.80	2.82	0.00
yrmo201602	5.94	2.47	2.40	0.02
yrmo201603	3.82	1.10	3.48	0.00
yrmo201604	3.39	1.07	3.16	0.00
yrmo201605	3.61	0.90	4.03	0.00
yrmo201506:pre_use	0.75	0.09	8.31	0.00
yrmo201507:pre_use	0.69	0.02	28.50	0.00
yrmo201508:pre_use	0.92	0.05	20.36	0.00
yrmo201509:pre_use	0.83	0.06	14.12	0.00
yrmo201510:pre_use	0.79	0.05	15.57	0.00
yrmo201511:pre_use	0.71	0.07	10.08	0.00
yrmo201512:pre_use	0.72	0.05	14.20	0.00
yrmo201601:pre_use	0.73	0.06	12.45	0.00
yrmo201602:pre_use	0.68	0.10	7.04	0.00
yrmo201603:pre_use	0.71	0.04	18.58	0.00
yrmo201604:pre_use	0.71	0.05	15.38	0.00
yrmo201605:pre_use	0.71	0.04	19.44	0.00

R-Squared: 0.93 Adj. R-Squared: .93

F-Statistic: 935.89 on 1,700 and 25 DF, p-value:0.00

Source: ComEd tracking data and Navigant team analysis.

Table 6-6. Parameter Estimates for RPPM Model for PY7 Wave

	Estimate	Std. Error	T value	P value
treatment	-0.78	0.27	-2.88	0.00
yrmo201506	4.16	0.56	7.43	0.00
yrmo201507	5.59	0.48	11.71	0.00
yrmo201508	7.21	0.59	12.25	0.00
yrmo201509	6.11	0.73	8.41	0.00
yrmo201510	4.61	0.41	11.30	0.00
yrmo201511	4.94	0.52	9.48	0.00
yrmo201512	4.72	0.71	6.61	0.00
yrmo201601	3.19	0.66	4.84	0.00
yrmo201602	3.52	0.72	4.88	0.00
yrmo201603	4.72	0.80	5.86	0.00
yrmo201604	4.36	0.49	8.99	0.00
yrmo201605	3.84	0.52	7.34	0.00
yrmo201506:pre_use	0.69	0.02	27.75	0.00
yrmo201507:pre_use	0.55	0.01	39.11	0.00
yrmo201508:pre_use	0.72	0.02	39.70	0.00
yrmo201509:pre_use	0.77	0.03	26.45	0.00
yrmo201510:pre_use	0.75	0.02	34.52	0.00
yrmo201511:pre_use	0.67	0.03	26.24	0.00
yrmo201512:pre_use	0.72	0.03	22.42	0.00
yrmo201601:pre_use	0.82	0.03	31.06	0.00
yrmo201602:pre_use	0.82	0.03	27.17	0.00
yrmo201603:pre_use	0.73	0.04	18.97	0.00

R-Squared: 0.90 Adj. R-Squared: .90

F-Statistic: 7,873.87 on 21,622 and 25 DF, p-value:0.00

Source: ComEd tracking data and Navigant team analysis.

Table 6-7. Parameter Estimates for RPPM Model for PY8 Wave

	Estimate	Std. Error	T value	P value
treatment	-0.36	0.15	-2.36	0.02
yrmo201507	0.56	2.49	0.22	0.82
yrmo201508	5.63	0.66	8.49	0.00
yrmo201509	2.02	0.33	6.13	0.00
yrmo201510	2.99	1.01	2.96	0.00
yrmo201511	2.20	0.46	4.80	0.00
yrmo201512	3.95	0.40	10.00	0.00
yrmo201601	3.97	0.38	10.49	0.00
yrmo201602	3.43	0.40	8.62	0.00
yrmo201603	5.09	0.44	11.56	0.00
yrmo201604	3.85	0.40	9.74	0.00
yrmo201605	2.47	0.32	7.68	0.00
yrmo201507:pre_use	0.74	0.11	7.07	0.00
yrmo201508:pre_use	0.92	0.03	30.89	0.00
yrmo201509:pre_use	0.87	0.02	53.56	0.00
yrmo201510:pre_use	0.79	0.07	12.16	0.00
yrmo201511:pre_use	0.78	0.03	26.85	0.00
yrmo201512:pre_use	0.70	0.02	33.54	0.00
yrmo201601:pre_use	0.75	0.02	42.89	0.00
yrmo201602:pre_use	0.76	0.02	38.96	0.00
yrmo201603:pre_use	0.62	0.02	28.41	0.00
yrmo201604:pre_use	0.72	0.02	30.59	0.00
yrmo201605:pre_use	0.80	0.02	39.59	0.00

R-Squared: 0.91 Adj. R-Squared: .91

F-Statistic: 14,750.04 on 32,694 and 23 DF, p-value:0.00

Source: ComEd tracking data and Navigant team analysis.

6.4 Savings Due to Participation Uplift in Other EE Programs

6.4.1 Uplift in PY8

Table 6-8 through Table 6-13 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 FFR program, the HEA program, the Rebate program, and 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. These tables show estimates of both positive and negative uplift, however, only positive uplift is used to adjust program savings for double-counting.

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. Navigant left out MESP for several waves, these were cases where no treatment or control customers participated in that program in either the pre- or post-program periods.

The tables also include the percentage change in EE program participation rate for CUB-ES 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 6-8. Estimates of Double Counted Savings in PY8, PY3 Wave

	FFR	HEA	Rebate
Median program savings (annual kWh per participant)	592	340	158
Number of treatment customers	2,227	2,227	2,227
Treatment rate of participation, PY8	2.02%	3.14%	2.47%
Change in rate of treatment participation from pre-program year	-0.94%	0.00%	0.00%
Number of matched control customers	2,102	2,102	2,102
Control rate of participation, PY8	1.09%	0.33%	1.14%
Change in rate of control participation from pre-program year	-0.48%	0.00%	0.00%
DID or POD statistic	-0.47%	2.81%	1.33%
Participant uplift	-10.41	62.58	29.57
Statistically significant at the 90% confidence level?	Yes	Yes	Yes
Savings attributable to other programs (kWh)	-6,160.00	21,272.80	4,684.20
Percentage change in EE program participation rate for participants	-19%	844%	116%

Source: ComEd tracking data and Navigant team analysis

Table 6-9. Estimates of Double Counted Savings in PY8, PY4 Wave

	FFR	HEA	Rebate
Median program savings (annual kWh per participant)	592	418	158
Number of treatment customers	2,315	2,315	2,315
Treatment rate of participation, PY8	1.73%	1.77%	1.94%
Change in rate of treatment participation from pre-program year	-1.30%	1.64%	0.00%
Number of matched control customers	2,169	2,169	2,169
Control rate of participation, PY8	0.74%	0.37%	0.78%
Change in rate of control participation from pre-program year	-0.88%	0.37%	0.00%
DID or POD statistic	-0.42%	1.27%	1.16%
Participant uplift	-9.72	29.46	26.86
Statistically significant at the 90% confidence level?	No	Yes	Yes
Savings attributable to other programs (kWh)	-5,754.90	12,324.90	4,253.80
Percentage change in EE program participation rate for participants	-20%	255%	148%

Source: ComEd tracking data and Navigant team analysis.

Table 6-10. Estimates of Double Counted Savings in PY8, PY5 Wave

	FFR	HEA	MESP	Rebate
Median program savings (annual kWh per participant)	592	500	0	158
Number of treatment customers	441	441	441	441
Treatment rate of participation, PY8	1.36%	2.04%	0.00%	1.81%
Change in rate of treatment participation from pre-program year	-0.91%	0.68%	0.00%	0.91%
Number of matched control customers	409	409	409	409
Control rate of participation, PY8	1.22%	0.00%	0.00%	0.98%
Change in rate of control participation from pre-program year	-0.24%	0.00%	-0.49%	0.49%
DID or POD statistic	-0.66%	0.68%	0.49%	0.42%
Participant uplift	-2.92	3.00	2.16	1.84
Statistically significant at the 90% confidence level?	No	Yes	No	No
Savings attributable to other programs (kWh)	-1,729.70	1,500.00	0.00	292.00
Percentage change in EE program participation rate for participants	-33%	50%	-100%	30%

Source: ComEd tracking data and Navigant team analysis.

Table 6-11. Estimates of Double Counted Savings in PY8, PY6 Wave

	FFR	HEA	Rebate
Median program savings (annual kWh per participant)	470	83	593
Number of treatment customers	72	72	72
Treatment rate of participation, PY8	1.39%	4.17%	5.56%
Change in rate of treatment participation from pre-program year	1.39%	0.00%	4.17%
Number of matched control customers	68	68	68
Control rate of participation, PY8	1.47%	0.00%	0.00%
Change in rate of control participation from pre-program year	-1.47%	0.00%	0.00%
DID or POD statistic	2.86%	4.17%	4.17%
Participant uplift	2.06	3.00	3.00
Statistically significant at the 90% confidence level?	Yes	Yes	Yes
Savings attributable to other programs (kWh)	967.50	249.20	1,779.90
Percentage change in EE program participation rate for participants	-194%	0%	300%

Source: ComEd tracking data and Navigant team analysis.

Table 6-12. Estimates of Double Counted Savings in PY8, PY7 Wave

	FFR	HEA	MESP	Rebate
Median program savings (annual kWh per participant)	592	500	315	246
Number of treatment customers	990	990	990	990
Treatment rate of participation, PY8	1.52%	2.22%	0.00%	1.72%
Change in rate of treatment participation from pre-program year	-1.01%	1.82%	-0.10%	1.41%
Number of matched control customers	934	934	934	934
Control rate of participation, PY8	0.96%	0.32%	0.00%	1.50%
Change in rate of control participation from pre-program year	-0.11%	0.32%	0.00%	1.50%
DID or POD statistic	-0.90%	1.50%	-0.10%	-0.08%
Participant uplift	-8.94	14.82	-1.00	-0.84
Statistically significant at the 90% confidence level?	Yes	Yes	No	No
Savings attributable to other programs (kWh)	-5,292.50	7,410.10	-314.70	-206.90
Percentage change in EE program participation rate for participants	-37%	206%	-100%	-5%

Source: ComEd tracking data and Navigant team analysis.

Table 6-13. Estimates of Double Counted Savings in PY8, PY8 Wave

	FFR	HEA	MESP	Rebate
Median program savings (annual kWh per participant)	592	323	170	160
Number of treatment customers	2,589	2,589	2,589	2,589
Treatment rate of participation, PY8	1.47%	3.55%	0.04%	2.05%
Change in rate of treatment participation from pre-program year	-1.00%	2.36%	-0.15%	1.31%
Number of matched control customers	2,462	2,462	2,462	2,462
Control rate of participation, PY8	0.45%	0.37%	0.00%	0.73%
Change in rate of control participation from pre-program year	-1.50%	0.16%	0.00%	0.69%
DID or POD statistic	0.50%	2.19%	-0.15%	0.62%
Participant uplift	12.91	56.79	-4.00	16.12
Statistically significant at the 90% confidence level?	No	Yes	Yes	Yes
Savings attributable to other programs (kWh)	7,641.90	18,360.50	-679.80	2,583.10
Percentage change in EE program participation rate for participants	51%	161%	-80%	44%

Source: ComEd tracking data and Navigant team analysis.

6.4.2 Legacy Uplift

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 were taken from the PY5 total resource cost report.[35] The measure life for the SFHES program is a simple average of the three measures included in that program. Table 6-14 shows the double counted savings (kWh) from each program in PY5. This table shows estimates of both positive and negative uplift, however, only positive uplift is used to adjust program savings for double-counting.

Table 6-14. Double Counted Savings (kWh) from PY5

	FFRR	CSR	CW	MF	SFHES
Measure Life	8	18	14	5.42	12
Double Counted Savings (kWh)	-11,451	14,611	18,491	-2574	-864

Source: ComEd tracking data and Navigant team analysis.

In PY6, Navigant considered double-counted savings for the following PY6 programs: SFHES, CSR, FFRR programs, and MF. The measure lives for PY6 programs were taken from the PY6 total resource cost report.[36] The measure life for the SFHES and MF programs are the simple average of the measures included in that program. Table 6-15 shows the double counted savings (kWh) from each program in PY6. This table shows estimates of both positive and negative uplift, however, only positive uplift is used to adjust program savings for double-counting.

Table 6-15. Double Counted Savings (kWh) from PY6

	SFHES	CSR	FFRR	MF
Measure Life	8.40	18	8	4.67
Double Counted Savings (kWh)	7,116	5,503	-49,828	-487

Source: ComEd tracking data and Navigant team analysis.

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[35] Navigant Consulting, Inc. 2014. *Review of EPY5 Total Resource Cost Test Assumptions.* Presented to Commonwealth Edison Company.
[36] Navigant Consulting, Inc. 2016. *Review of EPY6 Total Resource Cost Test Assumptions.* Presented to Commonwealth Edison Company.

In PY7, Navigant considered double-counted savings for the following PY7 programs: FFR, HEA, MESP, and Rebate. The PY7 total resource cost report is not yet available, so the program measure lives for PY7 are not included, but for the PY8 legacy uplift adjustment the reasonable assumption is made that each of these programs has a measure life of at least two years and should be deducted in PY8. Table 6-16 shows the double counted savings (kWh) from each program in PY7. This table shows estimates of both positive and negative uplift, however, only positive uplift is used to adjust program savings for double-counting.

Table 6-16. Double Counted Savings (kWh) from PY7

	FFR	HES	MESP	Rebate
Measure Life	-	-	-	-
Double Counted Savings (kWh)	-23,680	18,000	1,240	8,306

Source: ComEd tracking data and Navigant team analysis.