Southern California Edison's HER Persistence Pilot

Addendum Study Report

Prepared for Southern California Edison

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June 13, 2022

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1. Executive Summary

This document summarizes the addendum study to the evaluation of the Southern California Edison Co. (SCE) Home Energy Report (HER) Persistence Pilot. The primary objective of SCE's pilot was to understand what happens to customer behavior and energy savings if customers stop receiving HERs. This addendum study examines customer savings following the resumption of HER treatment. The original pilot was launched in October 2018 within SCE's "Wave 3" HER cohort, which began treatment in September 2015. Customers in this wave were segmented into two treatment cells: those who received paper HERs only, and those who received email HERs in addition to paper HERs. Customers in each treatment cell were randomly assigned to two groups under a robust experiment designed to test the persistence in savings: 50% of customers continued to receive paper HERs, and 50% no longer received paper HERs. Customers in the Paper + Email cell continued to receive electronic HERs. Customers in the Discontinued group resumed treatment in June 2020, twenty months after the Persistence Pilot began. The additional time before resuming treatment presented an opportunity to examine savings persistence beyond the originally planned 12-month period. Accordingly, the persistence of energy savings for the additional eight months between October 2019 and May 2020 is also included in this report. Finally, this addendum report presents new results from after treatment resumed (June 2020 through August 2021).

1.1 Key Findings

Key findings from the Persistence Pilot evaluation addendum study include:

- Savings from paper HERs persist for more than one year after the discontinuation of reports.
  - Discontinued customer electric savings were equal to 98% of Continued customer savings during the 12 months of the Persistence Pilot, and 82% for an additional eight-month period (month 13 through 20).
  - While the level of savings declined in the Discontinued group, the difference in energy savings between the Continued and Discontinued groups was not statistically significant.
- After treatment with paper HERs resumed, Discontinued customer electric savings continued to decline to 67% of Continued customer savings.
  - The difference between Continued and Discontinued groups is statistically significant during this period (month 21 through 35).

1.2 Study Limitations

While the experimental design of the Persistence Pilot was robust and the findings are internally valid, there remain a few limitations:

- It is important to note that the Pilot was unavoidably conducted in the context of the global COVID-19 pandemic that began to impact North American economies in March 2020. It is not possible to say if energy savings differences or other outcomes from the study would have been different without the influence of COVID-19.

- Further research is needed to determine if energy savings would continue to decline or would begin to rebound after more time with resumed treatment. This study only includes fifteen months of resumed treatment, and the outcomes may change by the second or third year.
- Finally, a more robust study may have resumed treatment for a randomly selected group of Discontinued customers. This would be beneficial for understanding the effect of resumed treatment (versus a longer pause in treatment). Unfortunately, the sample sizes available for this study were not large enough to precisely estimate incremental differences between Resumed and a Discontinued (but never resumed) groups.

1.3 Conclusions and Recommendations

These findings have implications to current program implementation, and in the future under a 3rd party program framework. Under the current program implementation structure with utilities administering the programs, there are opportunities to improve the cost effectiveness through implementing strategies to pause treatment for customers after receiving several years of treatment.

Several segments showed highly persistent savings – there are opportunities for reducing program costs:

- These segments include paper-only treatment customers in general, households with typical load profiles, and households with an average age of 50 or older showed highly persistent savings.
- Reducing the frequency of reports would likely have a similar effect to discontinuing reports entirely.
- A staggered program design could be considered, where mailers are provided for one year and not in another, with savings being evaluated and claimed for off-years.
- SCE may consider a shift to lower-cost channels by transitioning to email-only HERs after treating with a combination of paper and electronic reports.

Other customer segments exhibited a notable decline in savings even after treatment had resumed:

- These segments include early peaking households, later peaking households, households with an average age of under 50 years old, and households with incomes under $75k/year.
- SCE should consider maintaining continuous treatment for these customer segments.

2. Introduction

This document summarizes an addendum study to the evaluation of the Southern California Edison Co. (SCE) Home Energy Report (HER) Persistence Pilot. The primary objective of SCE's pilot is to understand what happens to customer behavior and savings if customers stop receiving HERs and after treatment with HERs resumes. Key research questions include:

- How long does the treatment effect persist after the cessation of HERs?[1]
- What is the energy savings decay rate per year after the cessation of the treatment with paper HERs?[1]
- Which types of customers are the most persistent savers?[1]
- Do energy savings of Discontinued customers return to that of Continued customers after resumed treatment with paper HERs?
- Which types of customers show the greatest increase in savings after resuming treatment?
- Did energy savings continue to decline for any groups of Discontinued customers?

This evaluation seeks to identify the persistence effect within the pilot as well as the effect of resuming treatment after a twenty-month pause. The pilot was launched within SCE's "Wave 3" HER cohort. Treatment customers in this cohort were divided into two populations, those with email addresses in SCE's database and those without. Both groups have been receiving paper HERs since September 2015 and the email group receives eHERs in addition to paper reports. A randomly selected group of 66,000 treatment households experienced a twenty-month pause in paper reports from October 2018 through May 2020.[2] This represents half of the active treatment population at that time and includes 27,000 non-email customers and 39,000 email customers (who continue to receive eHERs in the absence of paper reports). Table 2-1 summarizes the design of the Persistence Pilot.

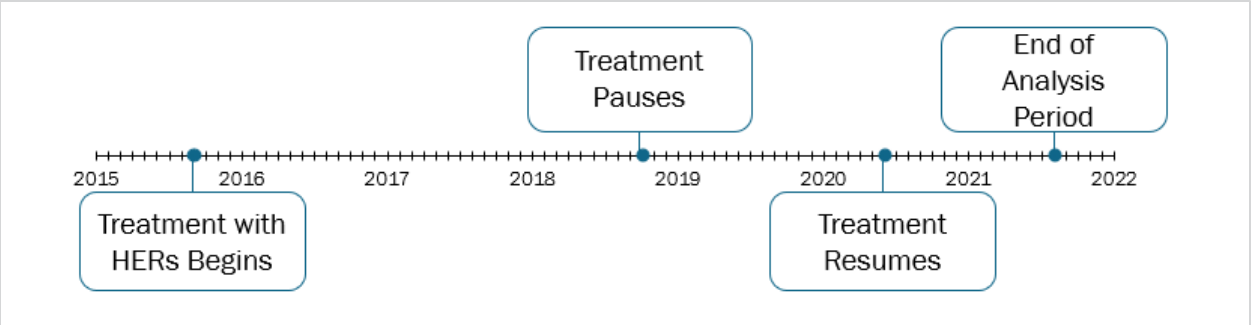
Table 2-1: Persistence Pilot Design

Wave 3 Group	eHER Status	Continues receiving print HERs	No longer receives print HERs
Paper-Only	Has never received eHERs	27,000	27,000
Paper + Email	Continues receiving eHERs	39,000	39,000
Total households		**66,000**	**66,000**

[1] Research question from the first phase of the study
[2] Discontinued customers resumed treatment with paper HERs in June 2020.

This evaluation includes persistence estimates for the period from October 2018 through September 2019 (P1) and October 2019 through May 2020 (P2). This time period covers one year and eight months after the cessation of paper HERs for the Discontinued groups. This report also includes a fifteen-month period (June 2020 through August 2021) after treatment with paper HERs resumed (P3). Figure 2-1 presents a timeline of the study.

Figure 2-1: SCE HER Persistence Study Timeline



The Continued groups and the Wave 3 control group were used to establish baseline energy savings. Next, persistence was estimated for the eHER and Paper-Only groups both separately and combined. Additionally, persistence in energy savings was estimated within specific customer segments and clusters.

The persistence of energy savings from HERs was estimated using a series of regression models. First, the energy savings from the Continued group from October 2018 through August 2021 was estimated to establish baseline energy savings.[3] This is the denominator when estimating the percent of savings that persist. Second, the difference in energy consumption between the Continued and Discontinued groups was estimated for the same time period. This represents the change in energy savings attributed to the discontinuation of the paper HER treatment. This process was conducted for the Paper-Only group, the Paper + Email group, and the two groups combined. A similar process was used to estimate persistence among specific customer segments and clusters. Energy savings and persistence were estimated using a lagged dependent variable (LDV) model in which pretreatment energy consumption is an explanatory variable.

The remainder of this report is organized as follows:

- Section 3 describes the methodology used to estimate the persistence of savings;
- Section 4 presents high-level persistence estimates for the Paper-Only and Paper + Email groups; and
- Section 5 presents the findings of the segmentation and clustering analysis.

[3] Savings and persistence levels were estimated separately for two time periods. P1 includes the first 12 months of the pilot, October 2018 through September 2019. P2 includes the following eight-month period from October 2019 through May 2020.

3. Methodology

This section summarizes the methodological approach used to estimate the persistence of energy savings after the cessation of treatment with HERs and after treatment resumed. The discussion is organized into two sections summarizing the approach for estimating the persistence of savings and the segmentation and clustering of customers.

3.1 Estimation of Persistence

This section summarizes the methodology that was used to address estimate the persistence of energy savings for the Persistence Pilot population. Persistence was estimated separately for each population (Paper-Only and Paper + Email) and for various customer segments outlined in the following subsection. For the purposes of this analysis, customers in the pilot were defined in three ways:

- **Control** customers are those who have never received HERs and are statistically equivalent to those in the following two groups.
- **Continued** customers are those who have received HERs since the launch of Wave 3 (September 2015) and will continue to receive reports through at least May 2020.
- **Discontinued** customers are those who received HERs from the launch of Wave 3 through September 2018. They did not receive reports between October 2018 and May 2020. Treatment with paper reports resumed in June 2020.

Table 3-1 presents summary statistics for the four customer groups identified in Table 2-1. The number of accounts reflect the actual number of customers who were assigned into each of the treatment groups, and who also had complete datasets at the start of the pilot. The average daily usage during the pre-termination period when all customer groups included in the table were being treated is approximately 23.0 kWh for the Paper + Email group, and 22.2 kWh for the Paper-Only group. The relatively large standard error indicates wide variation in usage patterns across customers. The minimum and maximum usage is also presented. Negative minimum values are due to customer generation flowing back onto the electric grid from net energy metered (NEM) customers— typically due to excess solar generation.

Table 3-1: Pre-Termination Usage by Discontinued, Continued, and Home Energy Report Group

Treatment Group	Report Group	# of Accounts	Daily Usage (kWh)				
			Average	Median	Standard Error	Minimum	Maximum
Discontinued	Paper-Only	27,032	22.2	20.3	10.2	-21.9	228.8
Discontinued	Paper + Email	38,577	23.0	21.4	10.9	-25.8	191.8
Continued	Paper-Only	27,144	22.2	20.2	10.2	-20.0	252.9
Continued	Paper + Email	38,513	23.0	21.5	11.1	-91.7	311.2

Table 3-2, Table 3-3, and Table 3-4 provide similar summary statistics broken out by age, income level, and home type. Average daily energy usage tends to increase with age, particularly after 70 years old. Average daily usage tends to be higher at the lower and higher income brackets, and lower in the middle-income brackets. Under home type the single-family home is the most prevalent, accounting for nearly 93% of the population.

Table 3-2: Pre-Termination Usage by Age

Age Bin	# of Accounts	Daily Usage (kWh)				
		Average	Median	Standard Error	Minimum	Maximum
Under 20	175	21.1	22.0	8.7	-3.5	54.6
20-29	4,938	20.5	21.0	10.2	-13.7	154.2
30-39	16,782	21.1	21.3	10.1	-21.5	147.7
40-49	27,882	20.8	22.0	11.0	-25.8	311.2
50-59	37,137	21.2	21.3	11.1	-31.9	257.3
60-69	24,261	21.5	20.3	10.7	-91.7	228.8
70-79	12,818	22.6	19.8	10.0	-21.2	252.9
80-89	5,660	22.9	19.0	9.0	-16.7	125.4
90-99	1,613	25.4	18.9	9.1	-7.0	93.1

Table 3-3: Pre-Termination Usage by Income Level

Income Level	# of Accounts	Daily Usage (kWh)				
		Average	Median	Standard Error	Minimum	Maximum
Less than $15,000	3,006	25.9	19.8	9.8	-13.7	186.1
$15,000 - $19,999	3,075	25.4	19.0	9.4	-14.4	154.2
$20,000 - $29,999	6,947	28.3	19.6	9.0	-12.5	138.5
$30,000 - $39,999	7,978	20.2	19.5	9.1	-13.0	205.3
$40,000 - $49,999	10,319	19.4	19.7	9.3	-21.2	188.3
$50,000 - $74,999	31,672	22.6	20.0	9.7	-31.9	252.9
$75,000 - $99,999	24,602	22.9	21.1	10.4	-27.3	311.2
$100,000 - $124,999	13,420	25.9	21.4	10.5	-48.0	202.0
Greater than $124,999	30,247	25.4	23.5	12.6	-91.7	154.7

Table 3-4: Pre-Termination Usage by Home Type

Home Type	# of Accounts	Daily Usage (kWh)				
		Average	Median	Standard Error	Minimum	Maximum
2-4 Unit Duplex/Triplex/Quad	46	25.9	21.7	12.3	12.5	57.0
Apartment	5	25.4	25.5	9.1	15.4	38.7
Condo	21	28.3	22.5	17.0	7.5	67.3
Miscellaneous	583	20.2	18.9	7.7	-6.0	52.5
Mobile Home	4	19.4	20.3	5.9	11.4	25.6
Single-Family Dwelling Unit	121,729	22.6	21.0	10.7	-91.7	311.2
Unknown	8,878	22.9	21.2	10.7	-11.9	252.9

The persistence of energy savings from HERs was estimated using a series of regression models. Energy savings were estimated for the Continued group for three time periods. The first time period, P1, includes the first twelve months of the pilot (October 2018 through September 2019) and the second time period, P2, includes the remaining eight months before treatment resumed for customers in the Discontinued group (October 2019 through May 2020). The third period, P3, represents the period after treatment resumed (June 2020 through August 2021). Energy savings were estimated using a lagged dependent variable model in which monthly energy consumption for Continued and control customers will be estimated using consumption data from the pretreatment and treatment periods. The outcome of this model was used to establish baseline energy savings separately for the Paper-Only and Paper + Email populations (along with other customer segments) to which the Discontinued groups can be compared. The regression specification is presented here with definitions for each term shown in Table 3-5.

$$\boldsymbol{kWh_{it} = a + b_t + c_t \cdot treatment_i + d_t \cdot pretreatment\_kwh_{it} + \varepsilon_{it}}$$

Table 3-5: Lagged Dependent Variable Model Definitions

Variable	Definition
kWh_{it}	Customer *i*'s usage in month *t*.
a	The estimated constant for energy consumption (average for all customers in all periods).
b_t	The estimated coefficient for the month indicator variable.
c_t	The estimated coefficient for the month indicator variable for treatment customers. This is the treatment effect for a particular month *t*.
$treatment_i$	The treatment indicator variable for customer *i*. Equal to 1 for treatment customers and 0 otherwise.
d_t	The estimated coefficient for pretreatment consumption on a particular month *t*.
$pretreatment\_kwh_{it}$	Pretreatment usage for customer *i* for month *t*. Pretreatment consumption for a particular month in the post treatment period refers to the same calendar month in the pretreatment period.
ε_{it}	The error term.

The second model estimated the difference in energy consumption between the Continued and Discontinued groups separately for the Paper-Only and Paper + Email populations (along with other customer segments) for P1, P2, and P3. The outcome of this model was the incremental difference in energy savings for each segment. Using a separate model made it possible to determine if the differences in energy savings between the Continued and Discontinued groups were statistically significant.

The following model specification was used to estimate the difference in energy consumption between the Discontinued and Continued groups is nearly identical to the specification above, with some small differences:

$$\boldsymbol{kWh_{it} = a + b_t + c_t \cdot discontinued_i + d_t \cdot pretermination\_kwh_{it} + \varepsilon_{it}}$$

Table 3-6: Lagged Dependent Variable Model Definitions

Variable	Definition
kWh_{it}	Customer *i*'s usage in month *t*.
a	The estimated constant for energy consumption (average for all customers in all periods).
b_t	The estimated coefficient for the month indicator variable.
c_t	The estimated coefficient for the month indicator variable for Discontinued customers. This is the incremental treatment effect for a particular month *t*.
$discontinued_i$	The Discontinued indicator variable for customer *i*. Equal to 1 for Discontinued customers and 0 otherwise.
d_t	The estimated coefficient for pre-termination consumption on a particular month *t*.
$pretermination\_kwh_{it}$	Pre-termination usage for customer *i* for month *t*. Pre-termination consumption for a particular month in the post treatment period refers to the same calendar month in the pre-termination period.
ε_{it}	The error term.

3.2 Segmentation and Clustering Analysis

In addition to estimating the persistence of energy savings for the entirety of the persistence pilot population, the persistence of different customer segments was also explored. Customer segments were created based on observable characteristics from the pretreatment period. Particularly, the average daily load shape and average monthly load shapes were used to isolate customers who have peak usage during different hours of the day and at different times of the year, respectively.

To cluster by daily load shape, AMI data was leveraged to estimate each customer's average hourly usage on non-holiday weekdays over the course of the pretreatment year. This yielded an average daily load profile for each customer, which was then normalized by dividing by the customer's total daily load. These customer load shapes, in terms of percentage of total load, were then used as the input into a k-medians clustering algorithm. K-medians clustering identified different usage patterns within the data, shown in Figure 3-1, and grouped customers into one of the three usage groups based on which load shape they align

most closely with. Descriptions for each of these groups are presented in Table 3-7. A total of three different groups was selected because this number provided an optimal balance between distinct customer groups and the sample size per group being large enough to allow for meaningful estimates.

Figure 3-1: Daily Load Shape Clusters

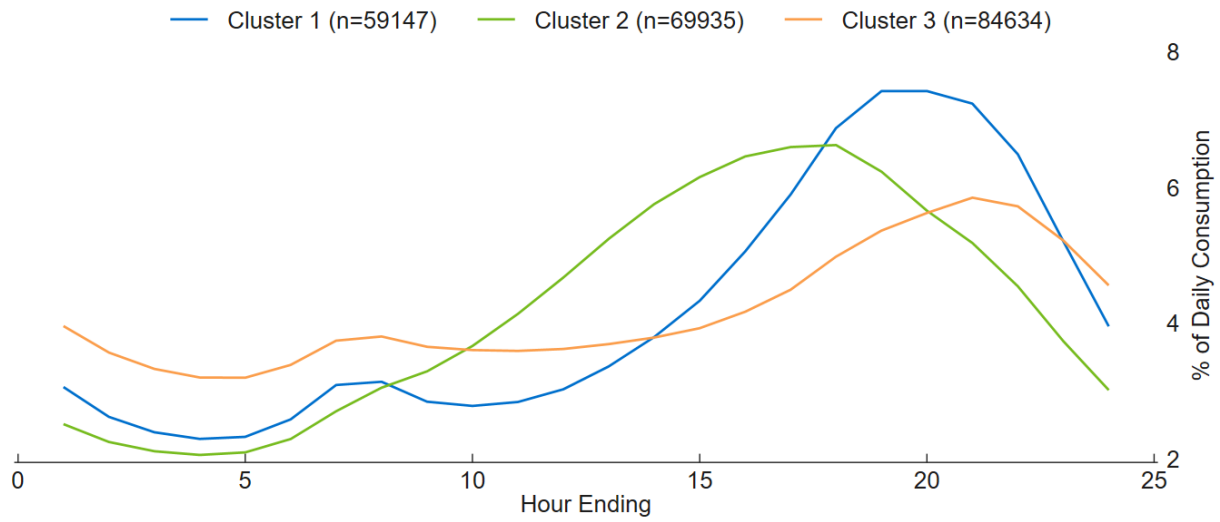


Table 3-7: Daily Load Shape Clusters Identified by K-Medians

Cluster	Cluster Description	Proportion of Customers
1	Typical users: peak usage occurs between 6:00pm and 7:00pm	27.7%
2	Early users: peak usage occurs between 5:00pm and 6:00pm	32.7%
3	Late users: peak usage occurs between 8:00pm and 9:00pm	39.6%

A similar process was followed to cluster customers by seasonal consumption, except that pretreatment data was aggregated at the monthly level for each customer rather than at the hourly level. This monthly data was then normalized for each customer using their total annual consumption. These seasonal customer load shapes were then fed into a k-medians clustering algorithm to produce three distinct usage groups, shown in Figure 3-2. Descriptions of these groups are presented in Table 3-8. A total of three different groups was selected for the seasonal load shape groups because the addition of more groups did not add any variety of seasonal shapes, but with three groups, a distinction could still be made between typical, low, and high summer usage groups.

Figure 3-2: Seasonal Load Shape Clusters

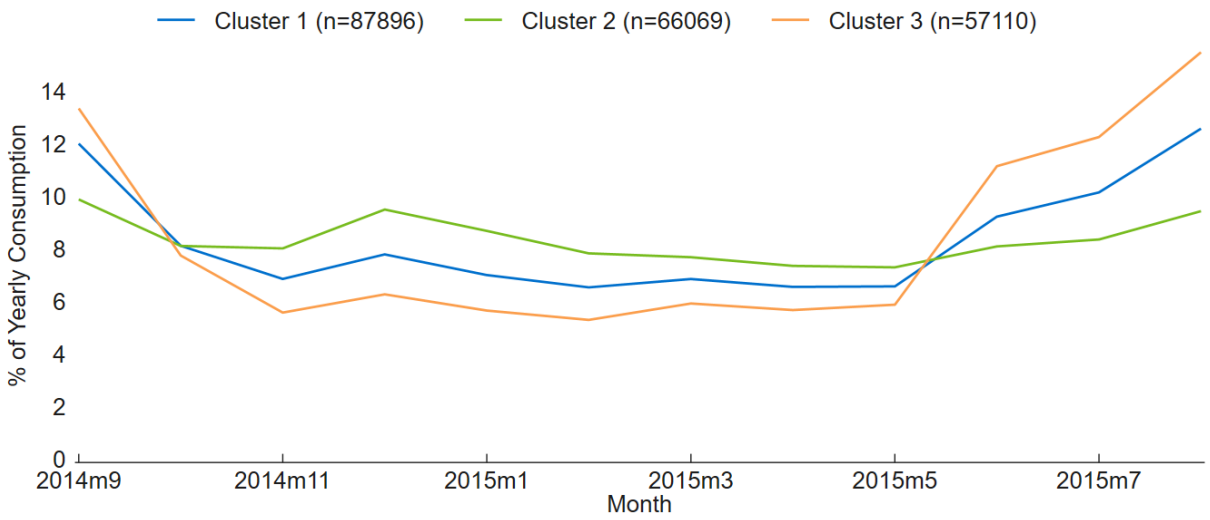


Table 3-8: Seasonal Load Shape Clusters Identified by K-Medians

Group	Group Description	Proportion of Customers
1	Typical users: load slightly higher in summer months	41.6%
2	Constant users: small difference between summer and winter month load	31.3%
3	Summer users: significantly higher usage in summer months	27.1%

Finally, customers were separated into segments based on their age and income. For the household age segmentation, customers were divided into those with an average household age over 50 years old and those under 50 years old. This cutoff was selected to maximize sample sizes. Similarly, households were divided into two income segments: those earning over $75,000 per year and those earning less than $75,000 per year. Energy savings persistence was estimated within each age group and income level using the same methodology described in Section 3.1.

Table 3-9: Age and Income Segmentations

Segmentation Type	Group Description	Proportion of Customers
Age	Average household age under 50 years	43.5%
	Average household age 50 years or older	56.5%
Income	Household income under $75,000	47.6%
	Household income $75,000 or more	52.4%

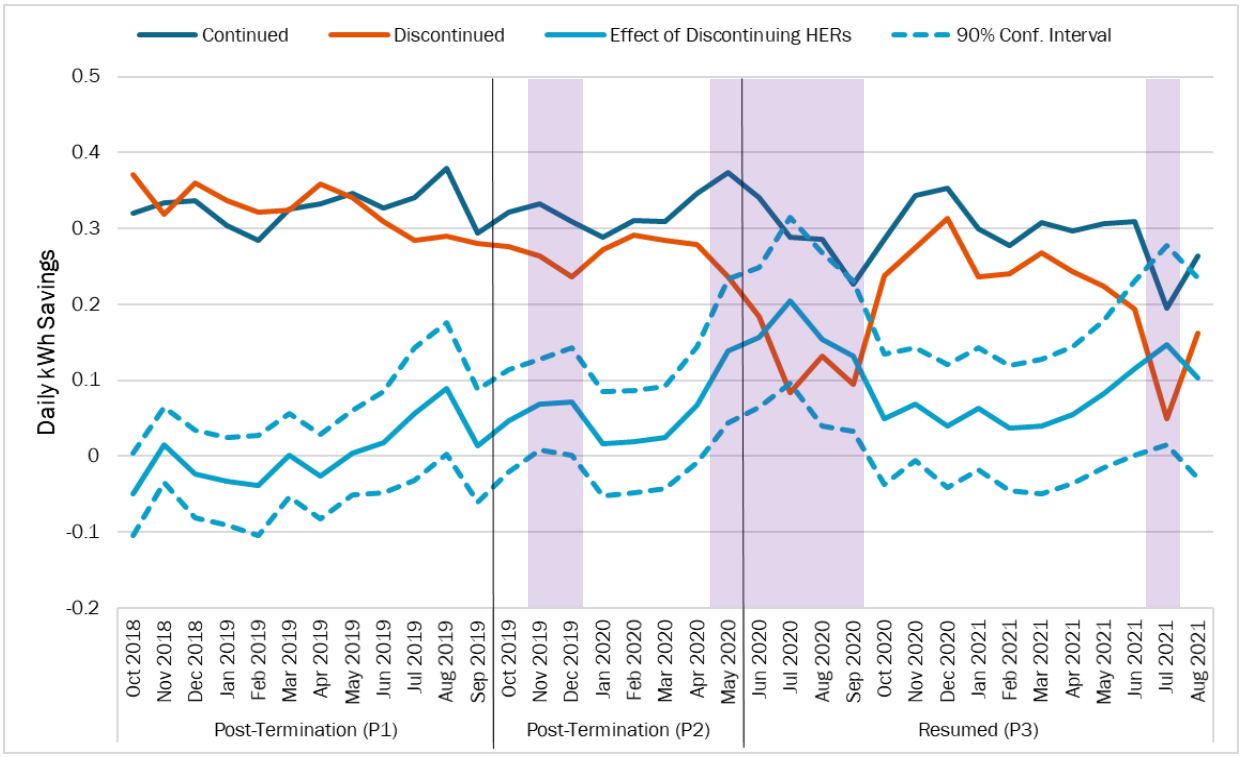
4. Persistence of Energy Savings

This report section summarizes the energy savings impacts for the different test cells in the persistence pilot (Continued and Discontinued, Paper-Only, and Paper + Email). Energy savings were estimated for the post-termination periods and the resumed treatment period for each group. The pre-termination period includes the twelve months prior to cessation of paper reports. The post-termination period is divided into two time periods, P1 and P2. P1 represents the first year of the pilot (October 2018 through September 2019) and P2 includes an additional eight-month period from October 2019 through May 2020. The third period, P3, represents the period after treatment resumed (June 2020 through August 2021).

Figure 4-1 shows the daily kWh savings estimates for each month in the post-termination and resumed treatment periods for all customers in the study. A negative effect of discontinuing HERs represents a reduction in savings. There were small differences in energy savings between the Continued and Discontinued groups during the pre-termination period. Given that the discontinuation of reports was randomly assigned and that the differences are not statistically significant, it is likely that these variations in savings are due to random chance.

After May 2019, the Discontinued group shows smaller savings compared to the Continued group. However, the difference is not statistically significant in any month in P1 and is only statistically significant in three months of P2 (November 2019, December 2019, and May 2020). Months with statistically significant differences in savings are highlighted in purple. This indicates that the savings from paper HERs persisted for more than one year. At the start of P3 when the treatment resumed, savings declined drastically, but rebounded after the summer months. Another drop can be seen in summer of 2021. During this period, differences in savings between the Continued and Discontinued groups were statistically significant for June through September 2020 and June and July 2021.

Figure 4-1: Daily kWh Savings and Savings Impact by Month – All Customers



Months with statistically significant differences in savings are highlighted in purple.

Figure 4-2 presents post-termination and resumed period annual kWh energy savings for the full persistence pilot population. Average energy savings per customer are presented separately for P1, P2, and P3. The blue bars represent the Continued group, and the orange bars represent the Discontinued group. Energy savings are lower in P2 compared to P1 because the estimate only includes eight months, rather than one full year. P3 shows the least savings for the Continued and Discontinued groups.

Baseline energy savings for the combined Continued group during the first year of the persistence study (P1) were equal to 119.7 kWh, or about 0.3 kWh per day on average. Savings for the Discontinued group were estimated to be 117.9 kWh (also about 0.3 kWh per day). The difference between the blue and orange bars, and indications regarding the statistical significance of the difference, are presented in Figure 4-3.

Figure 4-2: Post-Termination and Resumed Treatment Cumulative Energy Savings, per Customer

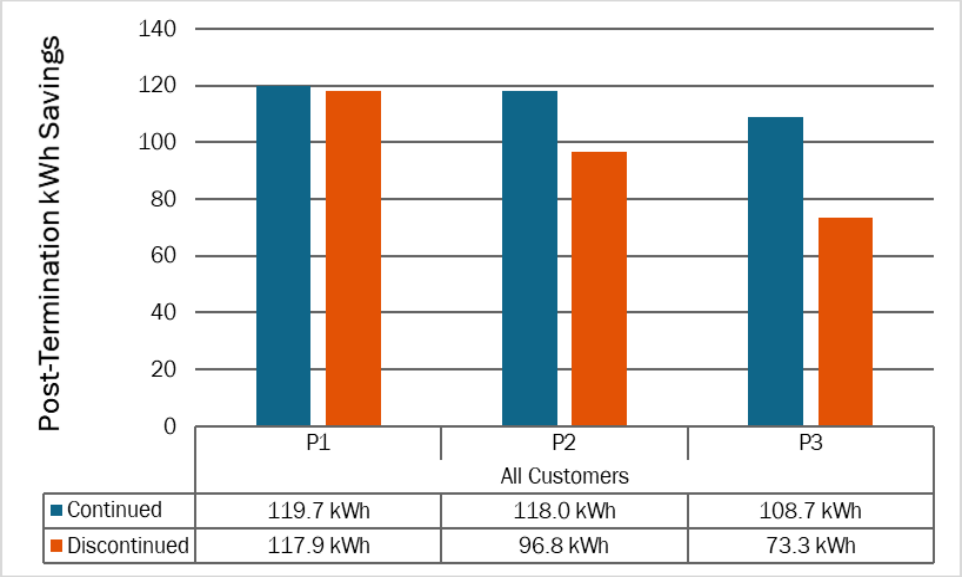


Figure 4-3 shows the level of persistence for the first twelve months of the persistence pilot (P1), the additional eight-month period (P2), and fifteen months of the resumed treatment period (P3). The lines bisecting the top of the orange bar in the figure show the 90% confidence band for the persistence estimate. If the confidence band includes 100%, it means the estimated difference in energy savings between the Continued and Discontinued groups is not statistically different from 0 at the 90% level of confidence.

Discontinued customers exhibited savings equal to 98% of the Continued group savings in P1 (October 2018 through September 2019) and 82% in P2 (October 2019 through May 2020). While the level of persistence is trending downward from P1 to P2, the difference in energy savings between the Continued and Discontinued groups was not statistically significant in either time period. In other words, the savings attributable to paper HERs persist for at least one year and eight months after discontinuation when viewed from this high-level time perspective.[4] After resuming treatment, savings Continued to fall for the Discontinued group to roughly 67% of the baseline savings. In contrast to P1 and P2, the difference in energy savings between the Continued and Discontinued groups became statistically significant during P3.

[4] As noted above, some individual months showed statistically significant differences.

Figure 4-3: Persistence of Energy Savings

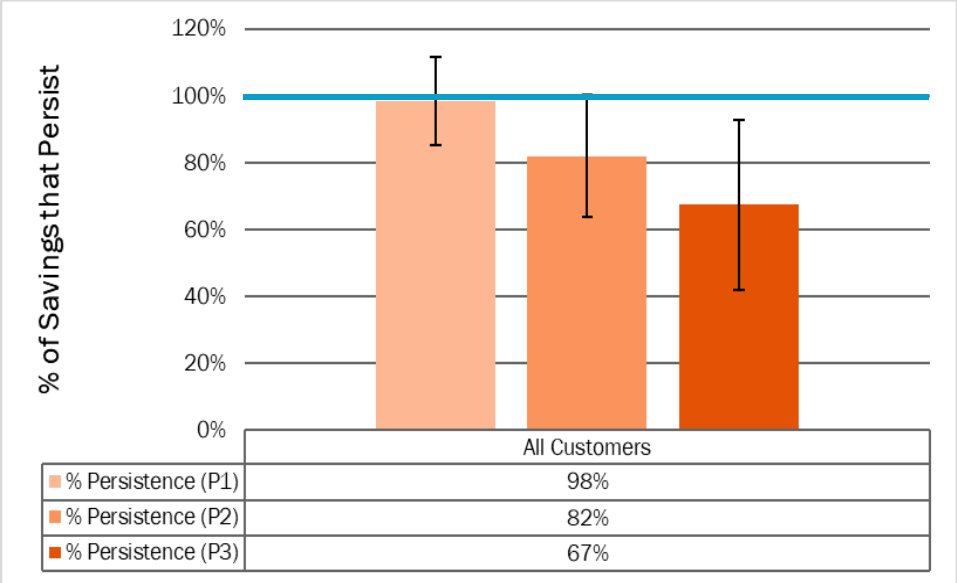


Figure 4-4 presents the post-termination and resumed period energy savings estimates for the Paper-Only and Paper + Email populations separately. Customers who received electronic HERs in addition to paper HERs had greater energy savings in all three time periods, which is likely due to a combination of differences in treatment and differences in the underlying populations.

Figure 4-4: Post-Termination and Resumed Treatment Energy Savings by Treatment Type, per Customer

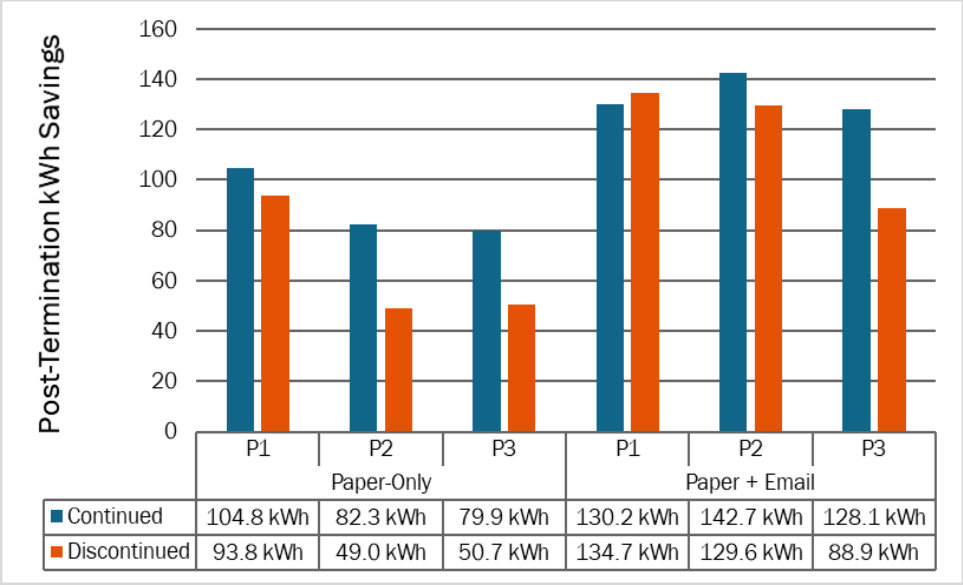
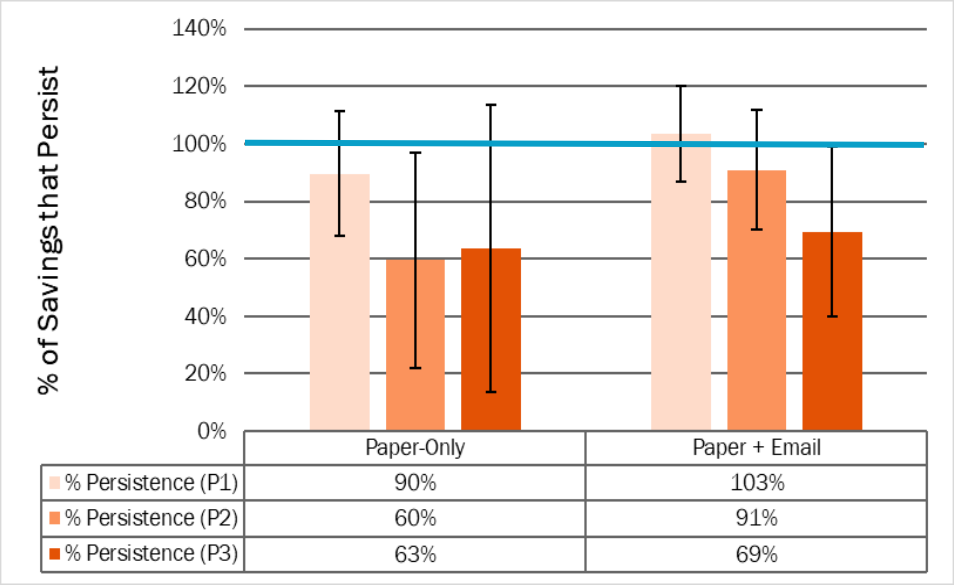


Figure 4-5 shows the level of persistence in the first year of the post-termination period (P1), an additional eight-month period (P2), and the resumed treatment period (P3). Customers who only received paper HERs showed a small decline in energy savings in P1 (10%), and a larger decline in P2 (40%). The level of persistence did not change by a meaningful amount after treatment resumed. The differences in savings between the Continued and

Discontinued groups were not statistically significant in any time period. The Paper + Email group, who Continued to receive electronic HERs, exhibited a small decline in energy savings than those of the Continued group during P2 and P3. The decline in energy savings in P2 was small and not statistically significant. In P3, the decline in savings was statistically significant for the Paper + Email population.

Figure 4-5: Persistence of Energy Savings by Treatment Type



	Paper-Only	Paper + Email
% Persistence (P1)	90%	103%
% Persistence (P2)	60%	91%
% Persistence (P3)	63%	69%

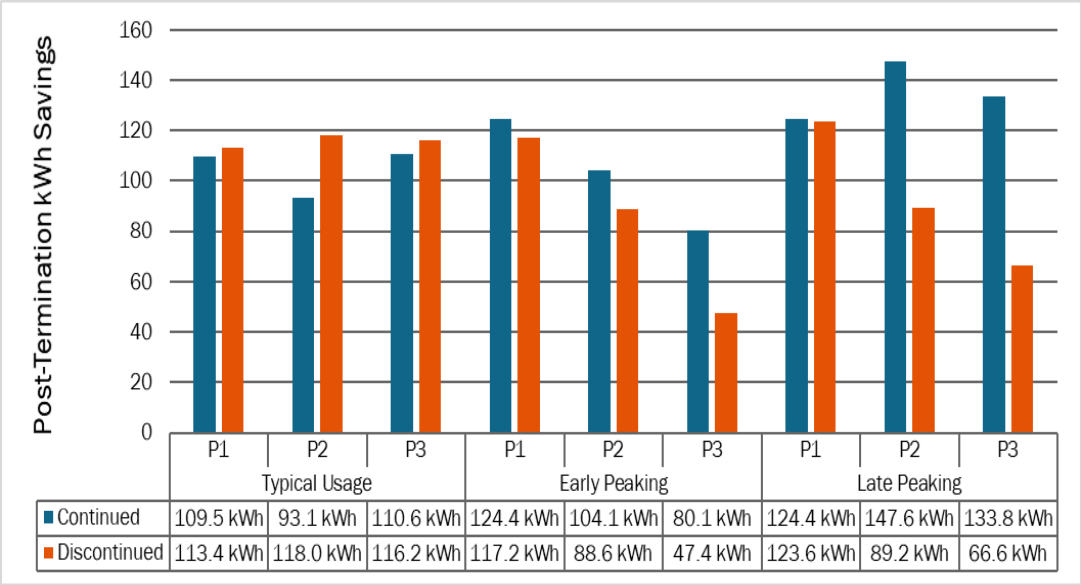
A key research question asks how the persistence effect varies among those who receive email HERs and those who do not. Because the group of customers who provide email addresses to SCE do not have the same baseline energy savings as those who do not as shown in Table 3-1, the two groups are not directly comparable. While the difference in pre-termination energy usage is between the Paper-Only and the Paper + Email groups is relatively small, the difference is statistically significant. There were also differences in savings levels between the two groups as well. For example, Continued customers in the Paper + Email group had greater savings in the post-termination and the resumed treatment period. Continued Paper + Email customers saved 130.2 kWh in the first twelve months of the post-termination period (P1), while Continued Paper-Only customers saved 104.8 kWh.

Although the two treatment populations had differences in baseline energy savings, they had similar levels of persistence in P1. The difference in the levels of persistence between the Paper-Only and Paper + Email groups (90% and 103%, respectively) is small and not statistically significant. While being cognizant of the dissimilarities in underlying populations, this small difference in energy savings persistence indicates that layering electronic HERs with paper ones does not lead to more persistent savings.

5. Segmentation Results

Figure 5-1 presents post-termination and resumed treatment period energy savings for each of the three daily load shape clusters, and Figure 5-2 presents the level of persistence within each cluster. Paper + Email early and late peaking customers had similar baseline energy savings in P1 (124.4 kWh per year). Typical usage customers had slightly smaller annual baseline savings during the same period (109.5 kWh).

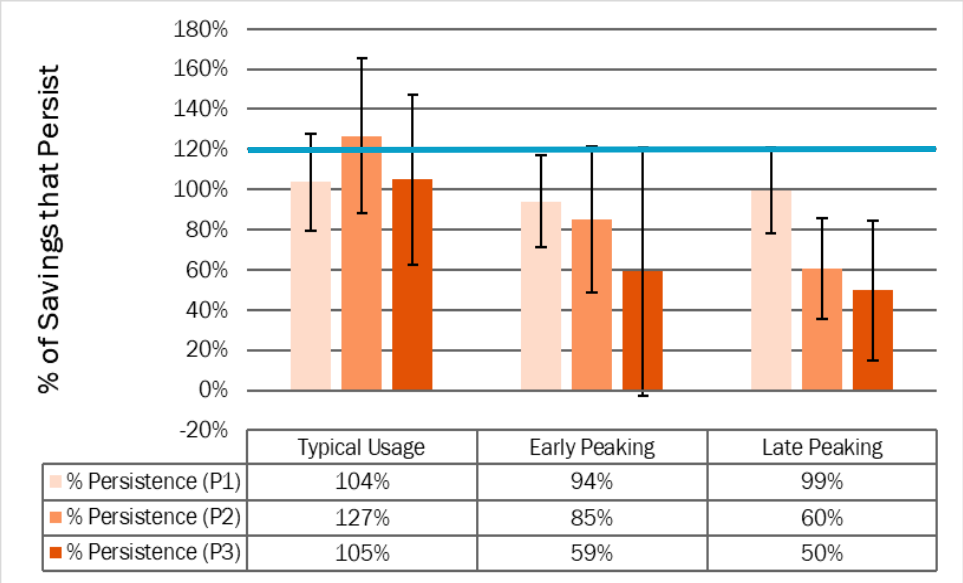
Figure 5-1: Post-Termination and Resumed Treatment Energy Savings by Load Shape Cluster, Per Customer



	Typical Usage P1	Typical Usage P2	Typical Usage P3	Early Peaking P1	Early Peaking P2	Early Peaking P3	Late Peaking P1	Late Peaking P2	Late Peaking P3
Continued	109.5 kWh	93.1 kWh	110.6 kWh	124.4 kWh	104.1 kWh	80.1 kWh	124.4 kWh	147.6 kWh	133.8 kWh
Discontinued	113.4 kWh	118.0 kWh	116.2 kWh	117.2 kWh	88.6 kWh	47.4 kWh	123.6 kWh	89.2 kWh	66.6 kWh

The level of persistence is not statistically significantly different from 100% for most of the three load shape clusters for either time period. The exception is customers in the late-peaking cluster, who showed a statistically significant decline in energy savings in P2 (a persistence level of 60%) and in P3 (a persistence level of 50%). In P1, the differences in persistence levels between clusters are small and not statistically significant. In P2 and the resumed period (P3), the differences between the clusters are more notable; the difference between the typical usage and late-peaking customers is statistically significant, indicating that late-peaking customers have less persistent savings than typical energy users. Early-peaking and late-peaking customers exhibited a further decline in energy savings after the treatment resumed.

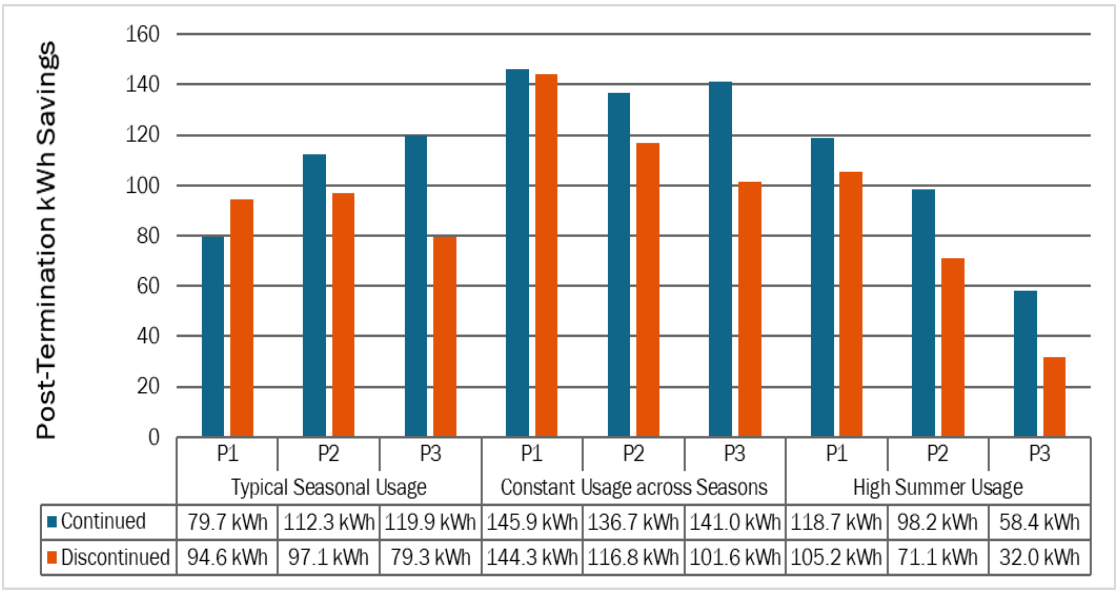
Figure 5-2: Persistence of Energy Savings by Load Shape Cluster



	Typical Usage	Early Peaking	Late Peaking
% Persistence (P1)	104%	94%	99%
% Persistence (P2)	127%	85%	60%
% Persistence (P3)	105%	59%	50%

Figure 5-3 presents the post-termination and resumed treatment period energy savings for each seasonal usage cluster for P1, P2, and P3. The typical usage cluster had the smallest baseline energy savings during the first year of the study (79.7 kWh per year) and the constant usage segment had the greatest baseline energy savings (145.9 kWh per year).

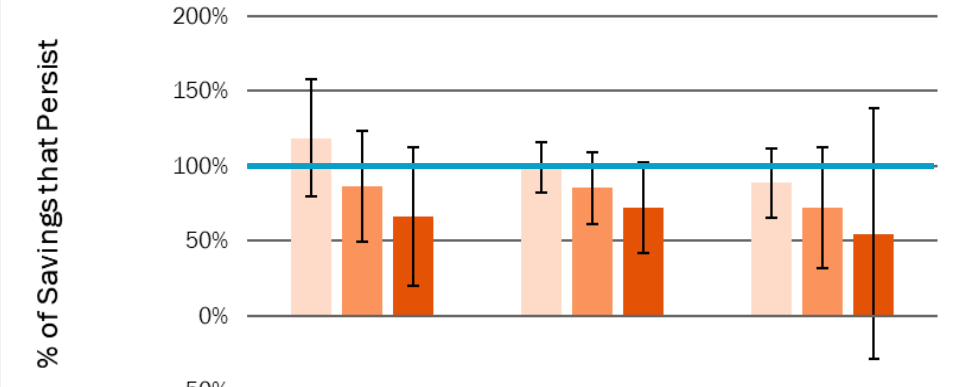
Figure 5-3: Post-Termination and Resumed Treatment Energy Savings by Seasonal Usage Cluster, per Customer



	P1	P2	P3	P1	P2	P3	P1	P2	P3
	Typical Seasonal Usage			Constant Usage across Seasons			High Summer Usage		
Continued	79.7 kWh	112.3 kWh	119.9 kWh	145.9 kWh	136.7 kWh	141.0 kWh	118.7 kWh	98.2 kWh	58.4 kWh
Discontinued	94.6 kWh	97.1 kWh	79.3 kWh	144.3 kWh	116.8 kWh	101.6 kWh	105.2 kWh	71.1 kWh	32.0 kWh

Figure 5-4 presents the level of energy savings persistence (relative to Continued customers) in each seasonal usage cluster. No segment had statistically significant reductions in savings in either post-termination period or the resumed treatment period, indicating that the savings persist in each seasonal usage category. In fact, customers in the typical seasonal usage cluster increased their annual savings during P1, but not by a statistically significant amount. Additionally, the differences in the levels of persistence across clusters is not statistically significant. In other words, one seasonal usage cluster does not show more persistent savings than another.

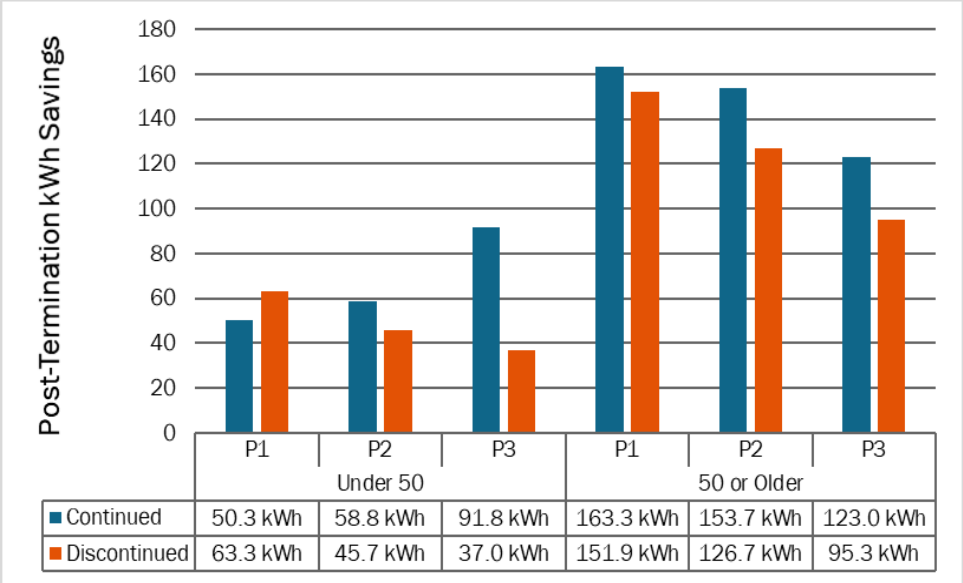
Figure 5-4: Persistence of Energy Savings by Seasonal Usage Cluster



	Typical Seasonal Usage	Constant Usage across Seasons	High Summer Usage
% Persistence (P1)	119%	99%	89%
% Persistence (P2)	86%	85%	72%
% Persistence (P3)	66%	72%	55%

Figure 5-5 shows post-termination and resumed treatment period energy savings for two age groups: customers under 50 years old and customers over 50 years old. On average, it appears that the older customer segment saves more energy than their younger counterparts (about 163.3 kWh per year in P1 versus 50.3 kWh per year, respectively).

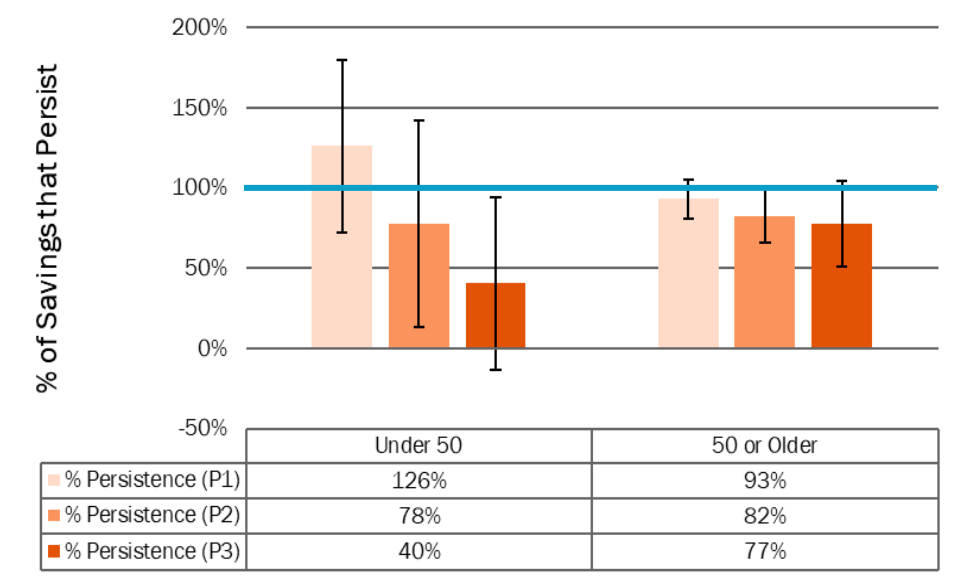
Figure 5-5: Post-Termination and Resumed Treatment Energy Savings by Age, per Customer



	Under 50			50 or Older		
Continued	50.3 kWh	58.8 kWh	91.8 kWh	163.3 kWh	153.7 kWh	123.0 kWh
Discontinued	63.3 kWh	45.7 kWh	37.0 kWh	151.9 kWh	126.7 kWh	95.3 kWh

While the group of customers with an average household age of under 50 years old appears to show an increase in savings in P1 of the discontinuation period, it is important to note that the confidence band on the estimate is very wide and includes 100%. The same group exhibited a statistically significant decline in savings during P3, after treatment had resumed, with a persistence level of 40%. The group of customers with an average household age of over 50 years old showed a statistically significant decline in energy savings in P2, with a persistence level of 82%. Savings continued to decline during P3, but due to the diminishing sample and wider confidence bands, the decline was no longer statistically significant.

Figure 5-6: Persistence of Energy Savings by Age



	Under 50	50 or Older
% Persistence (P1)	126%	93%
% Persistence (P2)	78%	82%
% Persistence (P3)	40%	77%

Finally, Figure 5-7 presents the post-termination and resumed treatment period energy savings for two income levels during P1, P2, and P3. The group with incomes less than $75,000 per year had smaller energy savings versus households who earned more than $75,000 per year (91.3 kWh per year compared to 145.5 kWh per year in P1).

Figure 5-7: Post-Termination and Resumed Treatment Energy Savings by Income, per Customer

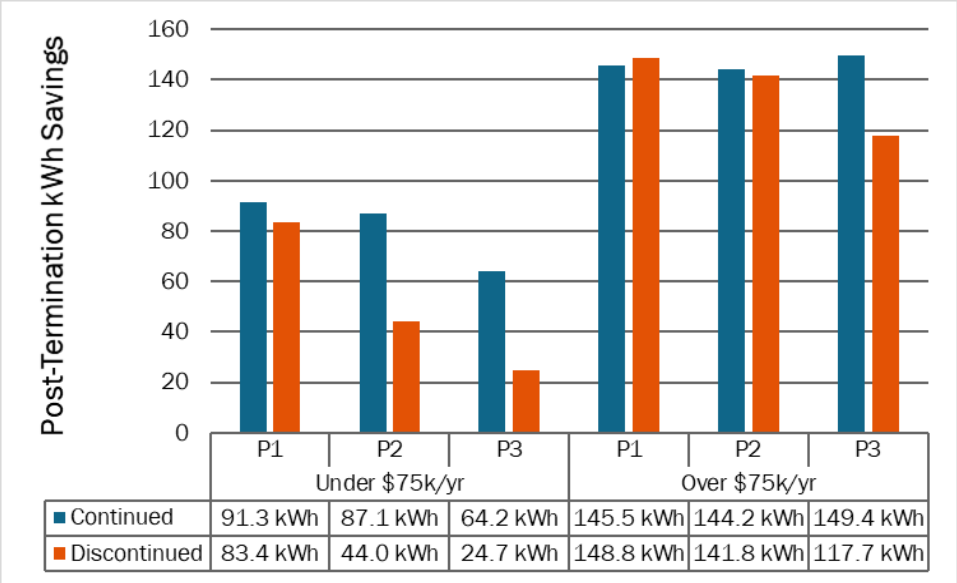
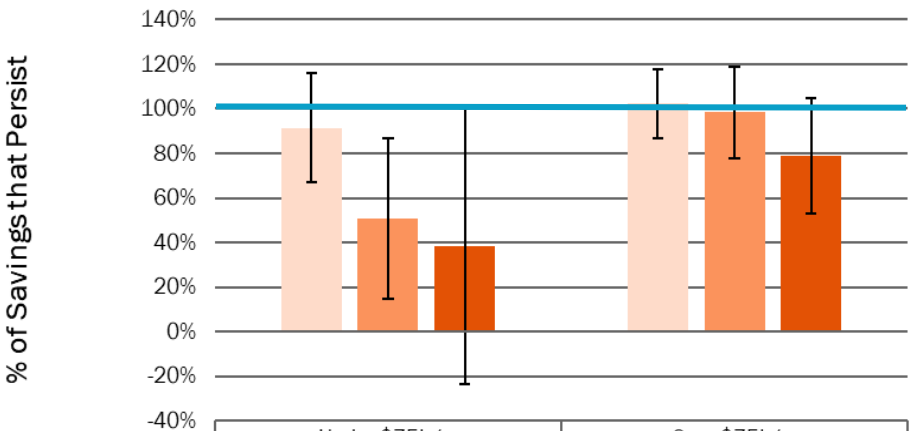


Figure 5-8 shows the percent of energy savings that persist in the first year of the pilot (P1). the additional eight-month period (P2) and the resumed treatment period (P3) for each household income segment. Customers with household incomes under $75k per year had high levels of persistence in P1 (91%) but showed a statistically significant decline in P2 (51%). In P3, after treatment had resumed, the decline continued but the confidence bands grew wider, leading to a result that was not statistically significant (39%). Customers with higher incomes had very small changes in energy savings that were not statistically significant in either post-termination period (102% and 98%). In P3, savings declined further but the difference between Continued and Discontinued groups were not statistically significant.

Figure 5-8: Persistence of Energy Savings by Income



	Under $75k/yr	Over $75k/yr
% Persistence (P1)	91%	102%
% Persistence (P2)	51%	98%
% Persistence (P3)	39%	79%