

What Motivates Action on Energy Efficiency?

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ABSTRACT

What strategies are most effective at motivating households to take energy-saving actions? This question is at the heart of an ongoing experiment called Customer Engagement, a collaboration between Energy Trust of Oregon, Hunt Allcott from New York University, and Michael Greenstone from the Massachusetts Institute of Technology. The Customer Engagement experiment is designed to answer two key questions that will inform Energy Trust's approach to program initiatives: 1) Does enhanced customer engagement or increased incentives lead to higher levels of additional program participation, or follow-through? If so, which strategy is more effective? 2) What strategy, if any, leads to more *timely* follow-through? To answer these questions, from March through December 2012 roughly 2,000 customers who received in-home or phone-based Home Energy Reviews (HERs) were randomly selected into one of three groups which differed in terms of the level and type of follow-up after the HER and the incentive amounts provided for certain measures after the HER.

In this paper, we assess the validity of random assignment to treatment and present results from a survey of customers in the experiment, which occurred between six and nine months after their HER. The three groups appear to be well matched, confirming the random assignment of treatment. Customer surveys do not indicate that customers took different actions after their HER based on the treatment received. Additional research is needed to determine if program participation after the HER did in fact vary based on treatment.

Background

Energy Trust of Oregon offers solutions and cash incentives to help residential, commercial, and industrial customers save energy and money. Residential homeowners served by Energy Trust's participating utilities, Portland General Electric, Pacific Power, NW Natural, and Cascade Natural Gas, are eligible for a range of incentives, including a free in-home or phone-based Home Energy Review (HER). As part of this review, trained Energy Advisors assess insulation, heating systems, air sealing and windows, ventilation, moisture issues, and appliances, either in-person or over the phone, and identify opportunities for homeowners to save energy. During in-home HERs, Energy Advisors also install CFLs and water saving devices (aerators and showerheads) to achieve energy savings.

For several years, Energy Trust had been contemplating changes to Home Energy Reviews to increase customer installation of energy efficient measures after an HER (follow-through). Internal analysis suggests that for HERs performed in 2011, about 13% went on to participate in other Energy Trust programs within 3 months. From the perspective of the residential program, HERs are an important customer service tool, and help engage customers with Energy Trust programs, but they are also resource intensive, requiring several hours of an experienced Energy Advisor's time for a relatively small, short-term payoff: the installation of a few CFLs and water saving devices. At the same time, HER participants indicated that the review itself did not provide sufficient information for them to move forward with an energy efficiency project or apply for an incentive.¹

Program staff hypothesized that increased and personalized communication, or "customer engagement" after HERs would lead to greater measure adoption by supporting customers' need for

¹ These findings come from an ongoing survey of Energy Trust program participants called Fast Feedback.

additional information and keeping energy efficiency at the front of his or her mind. The customer engagement strategy includes enhanced follow-up communications, presenting customized recommendations to customers after the review, and having the same Energy Advisor interact with a customer from the time of the review through follow-up after the review over the course of 90 days. Because of the additional staff time devoted to each participant, this strategy would also increase the overall cost of providing HERs in the form of staff time, training, and system upgrades.

A competing strategy briefly implemented by the residential program was an “Act Now” bonus, which provided an additional incentive to customers installing a measure within 90 days of the HER. However, this bonus had to be paid to all HER participants who installed a measure within 90 days, including those who would have installed a measure even without the bonus (free riders). While the bonus was hypothesized to increase follow-through, there had been no test of this conclusion or the size of the possible effect.

When these strategies were being considered internally, Hunt Allcott and Michael Greenstone approached Energy Trust with an interest in testing methods to increase uptake of weatherization and heating measures. These discussions resulted in the design of a randomized control trial to evaluate the effectiveness of customer engagement and a bonus incentive at inducing action after the HER relative to a control group receiving very limited post-HER communications and no bonus incentive. To reduce free ridership on the bonus incentive, the offer of additional financial incentives was made at 90 days, rather than immediately, after the HER.² This experiment aims to answer two key questions that will inform Energy Trust’s approach to HERs and other Program initiatives:

- What strategies lead to higher levels of follow-through?
- What strategy, if any, leads to more *timely* follow-through?

In this paper, we first describe the experiment and methods employed to evaluate the experiment. We assess the validity of randomization, and summarize findings from a survey of HER participants in all three experimental groups between six and nine months after their HER. We end with conclusions and a brief discussion of next steps.

The Experiment

Energy Trust and Allcott and Greenstone designed a randomized controlled trial to test whether customer engagement or increased incentives for select energy saving measures motivated customers to take action (Allcott & Greenstone 2013). From March through December 2012, roughly 1,700 phone-based and in-home HERs were randomly sorted into one of three groups: control, customer engagement, and financial. About 45% of HERs in the experiment were sorted into the customer engagement group, and about 28% each were sorted into the control and financial groups.³ Table 1 shows the number and percentage of HERs in each experimental group, as well as the number of in-home and phone HERs in each group.

Twenty-four customers had HERs performed on multiple properties (60 HERs total), and in some cases, these properties were selected into multiple experimental groups. In cases where there were multiple treatments, we did one of two things. If the HERs associated with a customer were in control and either customer engagement or financial groups, we changed the control group HERs to treatment HERs, reasoning that the “stronger” treatment was delivered to the customer. We dropped 16 HERs associated with five customers from the dataset due to these customers having HERs in both the customer engagement and

² Another reason for waiting to offer the bonus incentive was the hypothesis that, if this was a standard offering, customers ready to install a measure might realize they could get a greater incentive by having a HER first, increasing the program resources expended on HERs, but not increasing measure adoption overall. The downside of offering the bonus incentive 90 days after the HER is that this strategy does not increase follow-through within 90 days of the HER. The current requirement for the bonus is that the measure is installed within 90 days of the bonus offer, or 180 days post-HER.

³ The reason for the uneven group sizes is discussed in the Methodology section below.

financial incentive groups, which muddles the treatment received by the customer. There are 18 customers with more than one HERs in the dataset (42 HERs total); the rest of the customers are associated with a single HER. There are no cases in which a single site had more than one HER as part of the experiment.

Table 1. Summary of HERs in the experiment

	Control (Group 1)	Customer Engagement (Group 2)	Financial (Group 3)	Total HERs
In-home	393	654	417	1,464
Phone	74	138	86	298
Total	467	792	503	1,762
Percentage of Total HERs	27%	45%	29%	-

These three groups differ in terms of the level and type of follow-up after the HER, and the incentives provided for certain measures post-HER. Customers in the control group (group 1) received limited follow-up after their HER, similar to what had been delivered in prior years.⁴ This follow-up included the delivery of a custom home energy report with recommendations provided about a day after the HER, a generic thank you letter or e-mail 10 days after the HER, and a check-in phone call 90 days after the HER.⁵ Customers in the customer engagement group (group 2) received up to seven phone calls and e-mails tailored to specific customer interests and needs up to 90 days after the HER. Customers in the enhanced financial incentives group (group 3) received the same limited follow-up as the control group after their HER. However, group 3 participants were also offered additional incentives for select weatherization and heating measures (see Table 2) approximately 90 days after their HER, provided they had not taken action at that time and received recommendations after their HER for measures that qualified for additional incentives. Incremental funding for these additional incentives is being provided through a grant from the MacArthur Foundation.

Table 2. Measures eligible for additional incentives

Category	Measure	Current Incentive (\$)	With Match (up to 75% of cost of measure)
Insulation	Attic/ceiling	0.25/sqft	0.50/sqft
	Wall, floor, rim joist, or kneewall	0.30/sqft	0.60/sqft
	Boiler pipe insulation	0.50/sqft	0.60/sqft
Windows	0.25 U value or less	3.50/sqft	7.00/sqft
	0.26-0.30 U value	2.25/sqft	4.50/sqft
Heating	Heat pump replacing an old heat pump or non-electric heat	250	500
	Heat pump replacing electric resistance heat	450	900
	PTCS/CheckMe! (heat pump commissioning)	150	300
	Ductless heat pump	800	1600
	Direct vent gas unit heater	100	200
	Direct vent gas fireplace (based on efficiency)	200, 250	400, 500
	Gas boiler	200	400

Energy Trust is currently fielding a survey of approximately 350 customers in all three groups between six and nine months after HERs have taken place. The goal of the survey is to obtain information about customer satisfaction with the HER and follow-up, the actions customers report they have taken since

⁴ The program has changed its follow-up protocol in response to customer feedback over time. The key difference between the control group and follow-up delivered in 2011 is that the control group received a custom home energy report with recommendations specific to a customer's home and situation; this report was distributed to customers several days after the HER.

⁵ The 90 day check-in phone call was made to align the control group with the treatment groups, so that we could be sure any measured effect in the treatment groups was not due simply to receiving a phone call from Energy Trust 90 days post-HER.

the HER and any planned actions, the influence of the HER and follow-up treatment on action, and reasons why participants have not yet taken action (if applicable). This information will supplement and provide context for quantitative analysis of program participation. Preliminary results from this survey can be found in the Survey Findings section below.

Methods and Findings

Methodology

To gather the information needed to evaluate the Customer Engagement experiment, Energy Trust collected data at various stages of the HER process, summarized in Figure 1. When customers called Energy Trust to schedule a Home Energy Review in March through December 2012, they were randomly sorted into one of the three experimental groups. A unique identifier was assigned to each HER, the experimental group was recorded, and Energy Trust collected contact information as well as the type of HER requested by the customer (phone-based or in-home).

During the HER, Energy Advisors recorded the date the HER was completed as well as numerous datapoints about the site, including water and space heating fuel, utility provider(s), square footage, and year constructed. Based on this and other information collected during the HER, Energy Advisors compiled a list of recommended energy saving upgrades that was sent to HER participants in all experimental groups several days after the review. These recommendations were recorded in Energy Trust systems so that they could be linked to each HER.

<p>HER scheduling</p> <ul style="list-style-type: none"> • Project ID (unique identifier) • Experimental group • Contact information (customer name, phone, e-mail, site address) • HER type <p>During the HER</p> <ul style="list-style-type: none"> • Date of HER • Space and water heat fuel • Utility provider(s) • Square footage • Year constructed <p>After the HER</p> <ul style="list-style-type: none"> • Recommendations • Measure information <ul style="list-style-type: none"> ○ Contact information (customer name, phone, e-mail, site address) ○ Installation date (when measure was installed) ○ Measure type and description ○ Cost and savings (kWh and therms) ○ Incentive paid • Date the financial offer was made (if applicable) • MIT incentive amount and qualifying measures (if applicable) • Responses to survey (for select customers in the experiment)

Figure 1. Datapoints collected for evaluation

Energy Trust maintains a project tracking database with information about all installed measures for which it provides incentives, including the site at which the measure was installed, the type of measure, installation date, total cost and savings, and the incentive amount paid to the customer by Energy Trust. We can use this information to identify whether measures were installed after an HER. For customers in the

financial group, Energy Trust representatives made follow-up calls 90 days after the HER to offer additional financial incentives. As noted previously, we wanted to reduce free ridership by only offering these incentives to those that had not yet taken action. Prior to making follow-up calls, Energy Trust representatives checked the project tracking database to make sure the customer had received recommendations after their HER for measures that qualified for additional incentives and did not submit an incentive application. If the customer had not taken action and had recommendations that qualified for additional incentives, representatives would make the 90-day call and assess whether customers had scheduled work with a contractor. If the customer said they had not scheduled work, a representative would let the customer know of a limited time offer to receive additional incentives from the MIT Energy Initiative. In cases where we could not speak with customers directly, representatives mailed a letter to customers with information about the financial offer. Fifty-nine percent of sites in the financial group received financial offers. Participants were not offered additional incentives if they were not interested in taking action, had already moved forward with an energy efficiency project within 90 days of the HER, or did not receive recommendations for any measures eligible for MIT incentives.

If customers submitted incentive applications for qualifying measures within 90 days of the financial offer, they received a check in addition to the incentives provided by Energy Trust. Energy Trust recorded the measures installed that qualified for additional incentives, as well as the total incentive amount paid. Finally, Energy Trust is in the process of fielding a short survey of approximately 350 customers from the experiment, and we present preliminary results from this survey in the Survey Findings section.

The original goal was to include 4,800 to 6,000 HERs in this experiment, but we were only able to achieve a sample size of 1,700 overall. Several factors affected Energy Trust's ability to meet the sample size goals of the experiment. While the experiment was in the design phase, some program staff were concerned that having a control group would reduce savings; i.e., not offering these customers enhanced follow up communications or additional incentives would result in low levels of action. Customers for whom meeting savings goals was a high priority (customers receiving natural gas service from Cascade Natural Gas and SW Washington customers served by Energy Trust) were excluded from the pilot and provided with the customer engagement treatment to allay program staff concerns. In addition, Clackamas County, one of the most populous counties in Energy Trust's service territory, was offering County residents a bonus incentive for installation of energy efficiency measures receiving standard Energy Trust incentives, and had to be excluded from the Customer Engagement experiment.⁶ This exclusion reduced the size of the experimental population by nearly 30%. Once the experiment began, staff noted that overall HER volume in 2012 (about 4,300) was much lower than in previous years (down 29% from 2011). Reasons for this decline are not clear; marketing of HERs did not change, nor did the capacity of the program to provide HERs. Efforts to increase HER demand among customers met with very limited success. One potential explanation for the decline in HERs is the growth in Home Performance with ENERGY STAR® assessments in 2012.

The combination of these factors substantially reduced the number of households in the experiment relative to original assumptions. Ideally, an experiment could be continued until the sample size goals are met, but Energy Trust was limited to an extension of only three months (from September to December 2012), due to a change in program implementation contractor at the beginning of 2013.

Findings - Validity

The key virtue of randomization is the ability to create groups that are similar, such that differences in outcomes between groups after treatment can be attributed to treatment itself, as opposed to pre-existing differences (Shadish, Cook & Campbell 2002). However, it is important to validate randomization by looking at characteristics of the treatment groups to ensure they are similar. We looked at two sets of metrics

⁶ Clackamas County received funding from the American Reinvestment and Recovery Act (ARRA) to provide additional incentives to install energy efficiency measures incentivized by Energy Trust. These customers received the same treatment as those in the customer engagement group.

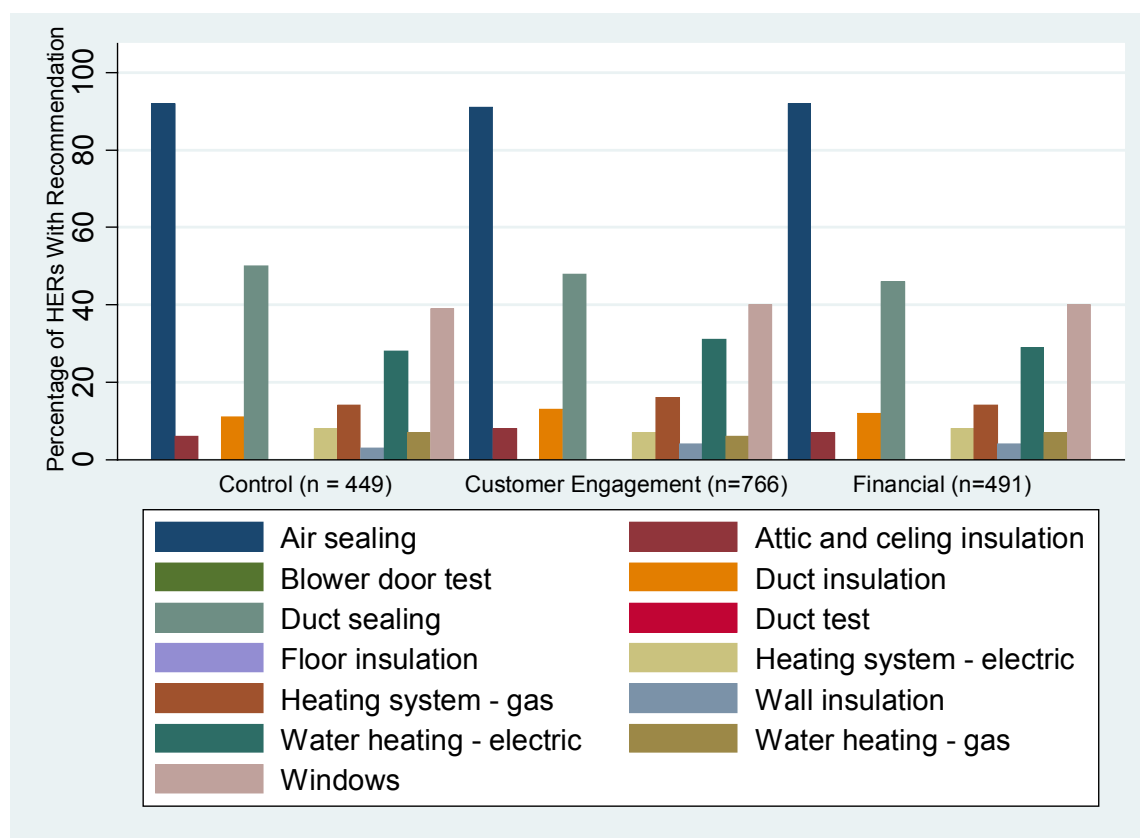
that helped us assess the validity of the results: site characteristics and recommendations provided to households. Key experimental outcomes, such as follow-through and savings, are likely influenced by site characteristics. For example, customers in newer homes may install fewer measures that qualify for incentives because their homes may already be efficient, and homes that are larger may have higher usage, and therefore, have more opportunities to save.

We are interested in identifying differences between the control group and each of the treatment groups. Using a two-group mean comparison test, we examined mean square footage and average age of the home. There are no statistically significant differences in these two metrics between the control and treatment groups. We used the chi-square test of significance to assess whether differences in space and water heating fuel are related to treatment group. We did not find any significant differences, indicating there is no relationship between space and water heating fuel and treatment group. We also used the chi-square test to assess whether there are differences in the percentage of participants that installed measures before their HER, but did not find a relationship between prior participation and treatment group.

Table 3. Site characteristics by group

Site characteristic	Control	Customer Engagement	Financial
Average square footage	1,994	1,936	2,040
Average age of home	46	47	48
Percentage gas space heat	56%	59%	58%
Percentage electric space heat	44%	41%	42%
Percentage gas water heat	47%	49%	44%
Percentage electric water heat	53%	50%	56%
Percentage prior participants	50%	52%	51%

Over 97% of all HERs received at least one recommendation; the mean number of recommendations was 2.5 (this was not significantly different among experimental groups). As Figure 2 shows, the distribution of recommendations is very similar across the three experimental groups. We looked at differences in the proportion of recommendations received by HERs in the control group relative to each of the treatment groups, and did not find any statistically significant differences (using a two-sample proportion test). This increases our confidence that the housing stock sorted into the control and treatment groups is fairly similar. The most common recommendations provided to customers were air sealing (provided to 91% of HERs that received at least one recommendation) windows (72%), and duct sealing (48%).



Note: The Ns in the figure above represent the number of HERs that received at least one recommendation.

Figure 2. Percentage of HERs receiving specific recommendations, by group

Findings - Survey Results

Energy Trust is interested in customer feedback on the HER experiences tested through the Customer Engagement experiment; we want to align the strategies we hypothesize drive follow-through and savings with a positive customer experience. Energy Trust continues to field a survey of approximately 350 customers between six and nine months after HERs have taken place. We have currently completed 275 surveys with respondents that had HERs in May-October 2012; participants that had HERs in November and December 2012 will be surveyed in June and July 2013. Eighty percent of survey respondents had in-home HERs. The percentage of survey respondents in each group is 37% control, 40% customer engagement, and 23% financial. There are two important considerations when interpreting these survey results. First, the percentage of financial group respondents is lower than the percentage in the experiment overall. Second, the majority of respondents in the financial group (95%) received the financial offer, although less than 60% of financial group HERs in the experiment received the offer. Therefore, survey results for financial group may not be representative of all financial group HERs.

Respondents provided feedback on their satisfaction with different aspects of the HER; Table 4 summarizes satisfaction with these various elements. The percentages in the table below represent the percentage of respondents rating the element a 4 or 5 on a 1-5 scale where 5 is “very satisfied.” Overall, respondents were most satisfied with recommendations provided by the Energy Advisor and overall experience. A chi-square test of significance only indicated a relationship between treatment and satisfaction with one element of HERs: information provided on how to apply for Energy Trust incentives (p-value: 0.09). Despite the more frequent and personalized communications with the customer engagement group, those respondents appear to be no more satisfied with information or communication from Energy Trust than respondents from the control or financial groups.

Table 4. Satisfaction with elements of HERs

Group	Recommendations provided by the energy advisor	Information provided on how to apply for Energy Trust incentives	Referrals to qualified Energy Trust trade ally contractors	Communication received from Energy Trust after the home energy review	Overall experience
Control (n = 103)	91%	88%	76%	78%	83%
Customer Engagement (n= 110)	85%	81%	76%	80%	82%
Financial Incentives (n = 62)	88%	75%	70%	74%	82%
All (n = 275)	88%	82%	75%	78%	82%

To gain insight into the influence of the financial treatment, we asked respondents in the control and customer engagement groups if they would have made, or made more, energy saving improvements if the available incentives had been twice as large. Half of respondents said they would have made more energy saving improvements had incentives been twice as large, and a chi-square test of significance indicates no relationship between treatment and making more improvements if additional incentives were available.

To examine the influence of the customer engagement treatment, we asked control and financial group respondents if they would have made, or made more, energy saving improvements if they received more communication from their Energy Advisor after the review. Only 26% overall said yes; control group respondents were slightly more likely to say yes (29%) compared to financial group respondents (23%) although this difference is not statistically significant.

We also asked respondents that reported making or planning to make improvements about the influence of the HER on these decisions. As Table 5 shows, 75% of control group respondents indicated the HER influenced their decision-making compared to 70% of customer engagement and 61% of financial group respondents. A chi-square test of significance was not statistically significant, indicating that treatment appears to not have a significant effect on follow-through.

A key question of interest is the extent to which the offer of additional incentives influenced action. 55% of respondents that received the incentive offer and reported making improvements qualifying for Energy Trust incentives indicated that it had an influence on their decision to install energy saving improvements, which is on par with the influence of the HER for this group.

Table 5. Influence of HER and additional incentives

Group	Influence of HER	Influence of additional incentives
Control (n = 69)	75%	-
Customer Engagement (n = 73)	70%	-
Financial Incentives (n = 38)	61%	55%*

*Asked of all respondents in the financial group that received the incentive offer and reported making improvements qualifying for Energy Trust incentives (n = 35).

We can ultimately analyze which measures were installed after an HER using program participation data, but chose to ask respondents about improvements made since the HER and any planned improvements to capture behavioral changes and any improvements for which we do not provide incentives and claim savings (and therefore do not track on a systematic basis). Improvements can be categorized into three groups:

- improvements that qualify for Energy Trust incentives, including appliances, heating, insulation, and solar,
- behavioral changes, such as turning off lights and turning down the thermostat, and,

- other improvements reported by respondents that do not fall into one of the categories above.

78% of all respondents said they had made, or plan to make, one or more of any of the improvements listed above. This number was slightly higher for control and customer engagement respondents (80% and 79%, respectively) compared to the financial group (73%). Based on these results, neither customer engagement nor additional incentives appear to have significantly affected energy efficiency actions or plans relative to the control group. More respondents reported already taking action (66%) than those that said they planned to take action in the next 6 months (32%) and a chi-square test of significance did not indicate a relationship between treatment and taking action, or treatment and plans to take action

The most common actions taken, shown in Figure 3, were insulation, “other” actions, and behavioral changes. The most commonly mentioned actions in the “other” category included water saving devices such as aerators and showerheads. Most respondents across all groups indicated that they planned to install insulation measures, including windows, duct sealing, insulation, and air infiltration testing. This makes sense, as these measures have a relatively high upfront cost that may be difficult for households to install in the short-term.

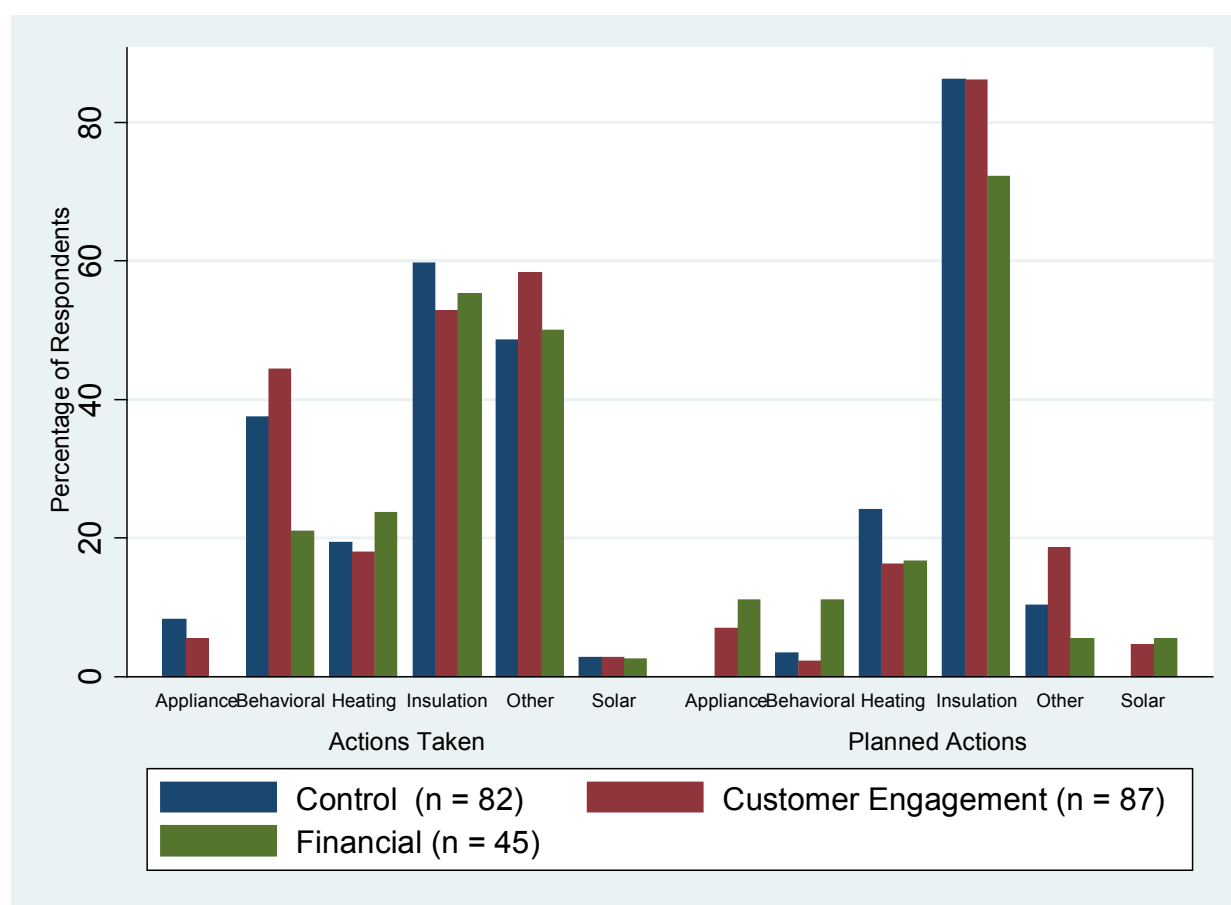


Figure 3. Actions taken and planned actions, reported by respondents

In addition to learning about the actions respondents had taken since the HER, and actions they plan to take, we wanted to learn about what motivated respondents to take actions that qualified for Energy Trust incentives. To minimize response bias, this question was open-ended, and interviewers characterized responses using pre-coded categories. Figure 4 below shows the most common motivations for taking action.

Respondents’ primary motivations were overwhelmingly related to saving energy, saving money on energy bills, and improving the comfort of their home.

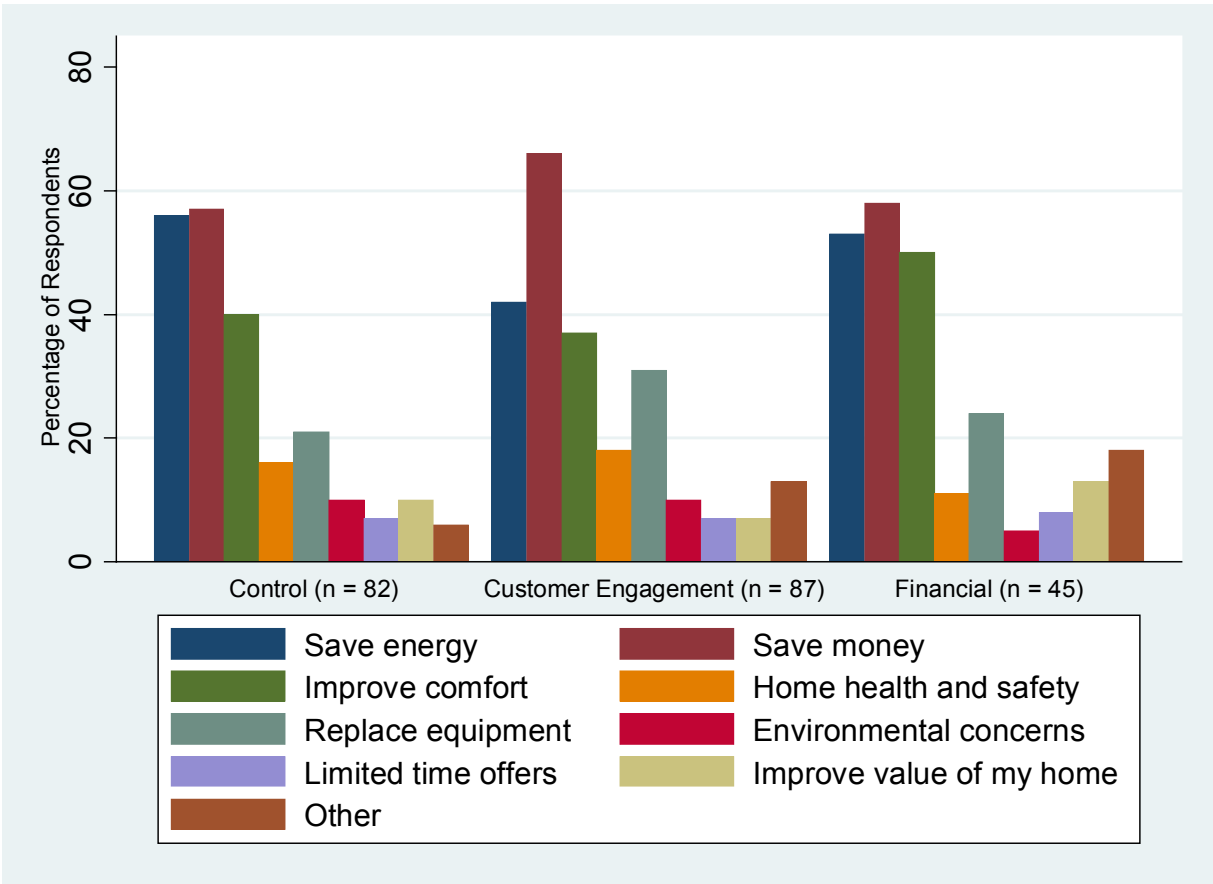


Figure 4. Respondent motivations for making improvements qualifying for Energy Trust incentives

For those respondents that did not make, and are not planning to make, Energy-Trust qualified improvements (about one-third of all respondents), we asked why they did not take action. Across all groups, the most common response was that improvements are too expensive and not affordable. Many financial group respondents reported reasons that fell outside of the pre-coded categories; these included concern that the improvements would not save energy and making other improvements.

Conclusions and Next Steps

In summary, customers in the three groups appear to be well matched in terms of housing characteristics and program participation prior to the HER, confirming the random assignment of treatment status. Customers in all experimental groups were generally satisfied with their HER overall and with various elements of the HER. About two-thirds of respondents reported that the HER had an influence on their decision to make improvements; this is a metric we plan to track over time using a survey fielded on an ongoing basis. 78% of all respondents said they made, or plan to make improvements or take action, and two-thirds of respondents reported already making improvements or taking action. Respondents that made improvements qualifying for Energy Trust incentives reported being motivated by saving money and energy and improving the comfort of their home; those that did not indicated that improvements were too expensive. These preliminary survey results suggest there are no significant differences in satisfaction, actions taken, or planned actions after the HER based on the treatment received. However, additional

research is needed to determine if program participation after the HER did in fact vary based on treatment, which we plan to investigate using program participation data, and can compare to these survey results.

December 2012 was the cutoff for HERs to be included in the Customer Engagement experiment. For the financial group, all financial offers were made by March 2013, 90 days after the last HER, and there is a 90 day window during which improvements qualifying for the financial incentive must be made (June 2013). Energy Trust's policy is to provide an additional 90 day grace period for customers to submit incentive applications following work on their home, so we expect all measures qualifying for additional financial incentives to be submitted to Energy Trust by the end of September 2013.

When all of the applications for additional financial incentives are submitted, Energy Trust and Allcott and Greenstone will be able to evaluate the effectiveness of the financial offer in terms of follow-through at multiple points in time (3 months, 6 months, and 1 year after the HER), and look specifically at differences in uptake of measures for which additional incentives were provided to the financial group. Additionally, we will use energy consumption data and a variety of explanatory variables collected during the HER to estimate the measure and non-measure energy savings of participants in each group, and compare the savings between groups to see if treatment – customer engagement or enhanced financial incentives – results in more savings relative to the control group. These analyses will help us draw final conclusions about the effectiveness of both treatments (Allcott & Greenstone 2013).

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