Using Social Psychology to Drive Deep Energy Retrofits

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ABSTRACT

In recent years, the use of social psychology to induce small, daily behavioral changes for energy conservation has been well explored. However, the application of social psychology to encourage home upgrades (single measure or whole-home retrofit) is relatively untouched territory.

We collaborated with researchers at the Energy Trust of Oregon, the Department of Energy, Harvard Business School and UCLA to run online consumer experiments to combine best practices from behavioral economics, building science and online marketing in the service of driving homeowner engagement in taking action on home energy upgrades. Three specific studies are covered in this paper:

- **Visual Testing on the Department of Energy's Home Energy Score**: How to drive emotional engagement with home energy efficiency through visuals and label design.
- **Email targeting and customization:** Testing and establishing best practices for re-engaging homeowners by email after an initial online audit survey.
- **Optimizing online engagement with home energy surveys**: How to effectively position and message online energy audit experiences that drive results (results pending).

These studies examined the effects of design and messaging on engagement, and found that, in general, simpler designs or messaging with less data and/or words are most effective. Additionally, more straightforward informative tones work best in email (recipient didn't actively seek out the experience); whereas, friendly personalized language may work best for website label design (user actively visited a site). These trends and our more specific findings below can inform the decisions of program implementers who are trying to encourage homeowner demand.

Introduction

Home energy efficiency programs around the country, run by most utilities and by government entities at all levels, have at least one common goal: to reduce the energy wasted by the nation's aging housing stock. And they all share common tactics: lavishing homeowners with incentives, tax credits and low-interest loans to induce them to upgrade the efficiency of their homes through low-tech, but high-impact, measures such as adding insulation, upgrading to new high-efficiency heating and cooling equipment and sealing air leaks in the home's living space.

Yet, no matter how generous these programs are–many offer thousands of dollars of incentives per home–they all face a common problem. The problem: actually getting homeowners to care about efficiency and to take action. Across the country, home energy efficiency programs suffer from a demand creation problem.

Traditional energy efficiency programs have tried to address this problem through building overwhelmingly solid return-on-investment (ROI) cases for homeowners. For example, implement an efficiency measure that costs $1,000 in a home and it will return $200 per year in reduced energy bills. Then the organization will give the homeowner a $500 rebate upfront and a zero-interest loan for the other $500, payable over five years. Why would any homeowner not take that deal? Or, in the words of one utility energy efficiency program manager, "Reasonable people who are reasonably informed will come to reasonable conclusions."

The problem is that most people will not take that deal. Why? The emerging field of behavioral economics would explain that it is because most people do not evaluate ROI in a rational way (Ariely 2008). Or put another way: People are irrational. Give them reasonable information and they will still make bad decisions. So what does work? We have been working on this problem for a while at EnergySavvy and can share some of what we have learned from several studies we have done or are doing now in conjunction with our partners and customers.

Visual Testing on the Department of Energy's Home Energy Score

EnergySavvy, Sentech and the U.S. Department of Energy collaborated to design and conduct an online test of potential visual elements for the new national Home Energy Score, to determine what design elements have greater visual appeal and create an "emotional tug" for homeowners to further engage with home energy upgrades.

Test Design

Since the primary differences we were testing for were visual differences, we used online ad buys to drive traffic to different landing page variations and compared the conversion rates (number that clicked action link/total page visitors) on each landing page to determine whether different label design elements lead to higher or lower engagement rates (Figure 1). A display ad unit was created and run on a run-of-network (RON) buy on Advertising.com. Ad.com is the largest and broadest display ad network in the U.S. By using Ad.com's RON channel, we ensured the broadest possible exposure across the largest possible cross-section of U.S. users on the internet, eliminating any potential impact due to website-specific placement (Figure 2). Additionally, for volume (and cost-effectiveness purposes), we used a number of Google AdWords/AdSense text placements that were run in contextually relevant settings (Figure 2). Despite the differences in traffic quality, we were able to keep the proportions of inbound traffic to each ad unit variation roughly equal.

Clicking on any of the ad units took users to various versions of the same landing page, hosted at www.homeenergylabel.com (Figure 3). In each variation, the only difference was the graphic image of the label on the left side of the page, which was a preview of a Home Energy Score results page. Everything else was held constant. In our test, we experimented with eight different label variations (plus baseline) that emphasized different design or information elements (Figure 4), and we used an online A|B testing product called Optimizely to host and conduct the experiment.

Figure 1: Home Energy Score Variation Test Design

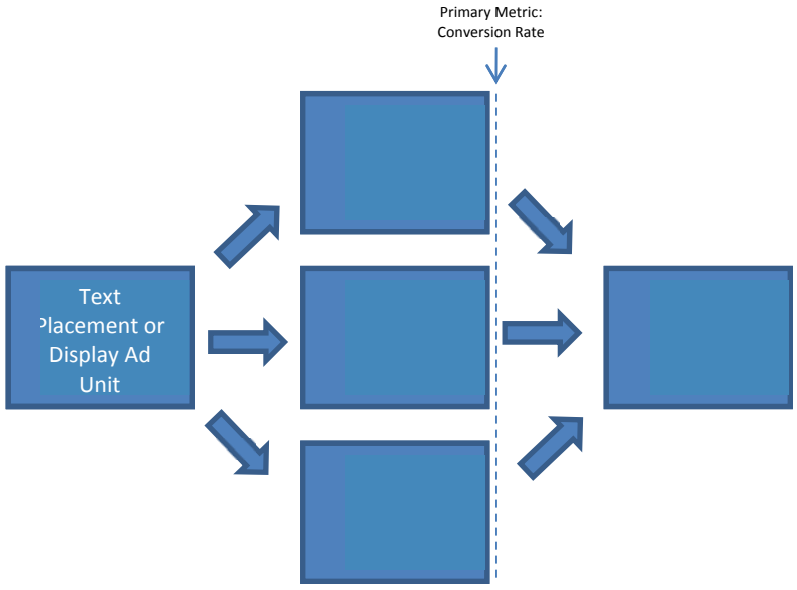
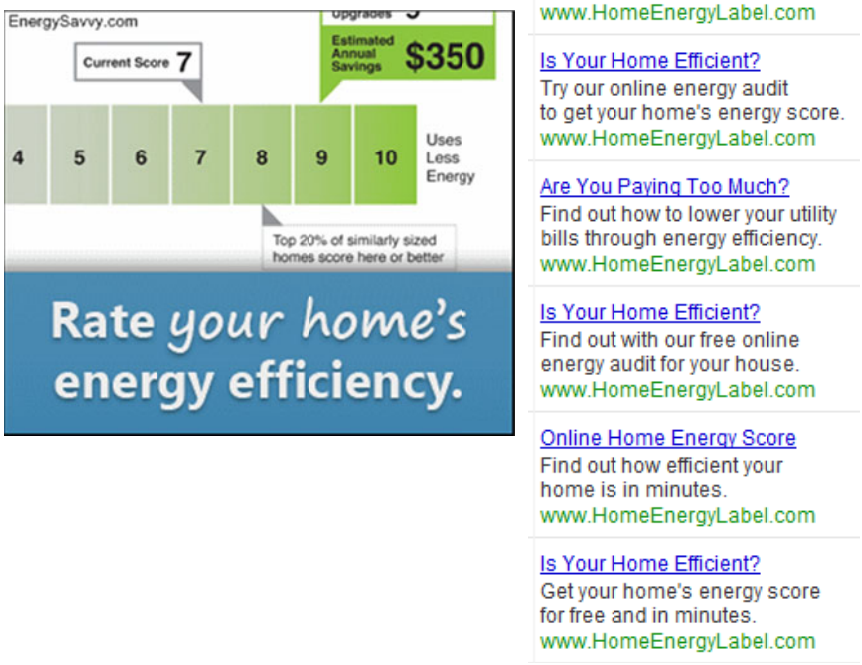


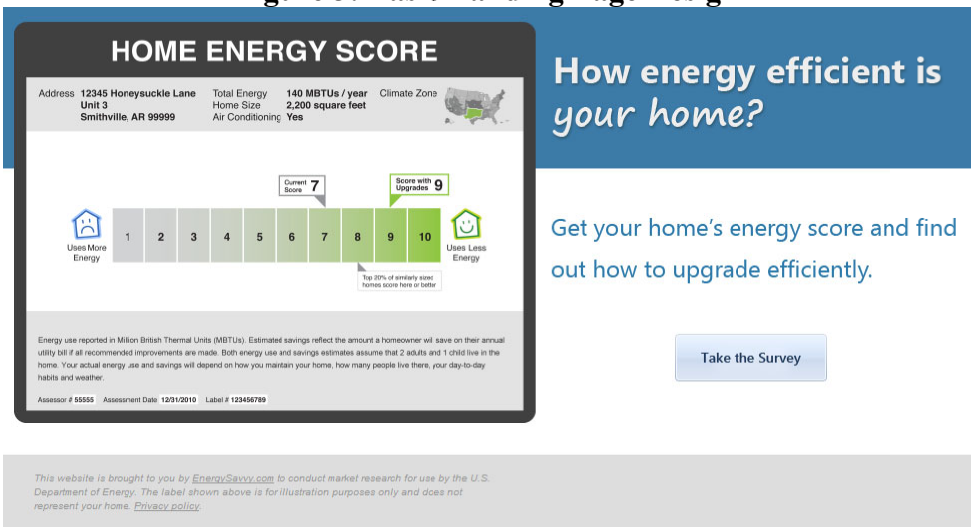
Figure 2: Online Ad Creative Used in Home Energy Score Test



ad

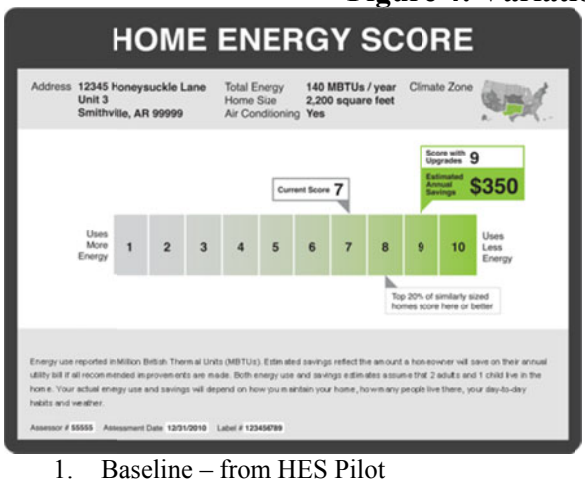
Upon click of the "Take the Survey" button, a conversion event was recorded before users were directed to a special version of EnergySavvy's online audit: http://www.energysavvy.com/estimate/ as a proxy "dump off" point. Users were informed that they were exposed to a test and that the labels shown were not yet available, but allowed to continue to use EnergySavvy's online audit tool to learn about their home. It was for this reason that we included variations of the initial landing page rather than the Home Energy Score results page itself; the Home Energy Score has not been linked to the EnergySavvy online audit at this time.

Figure 3: Basic Landing Page Design

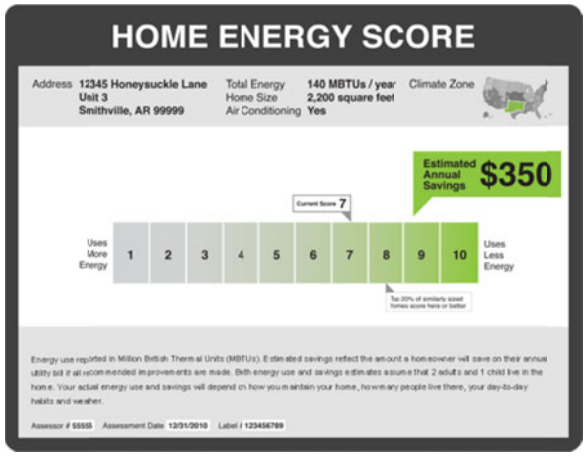


The Home Energy Score image on the left of the landing page was the only element that varied in each test case.

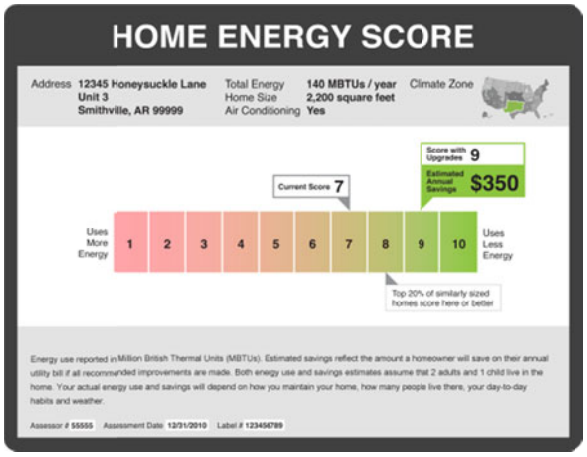
Figure 4: Variation Visualizations Tested



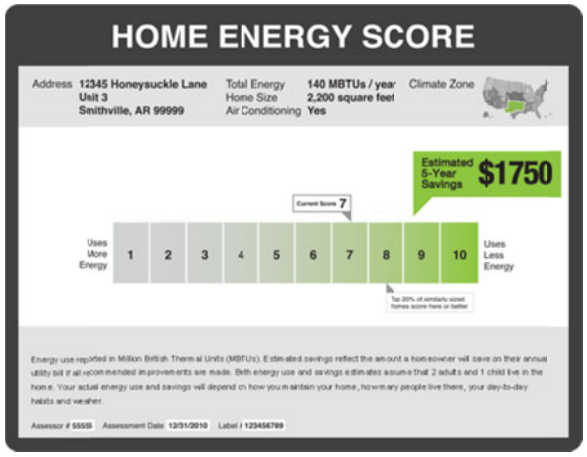
1. Baseline – from HES Pilot



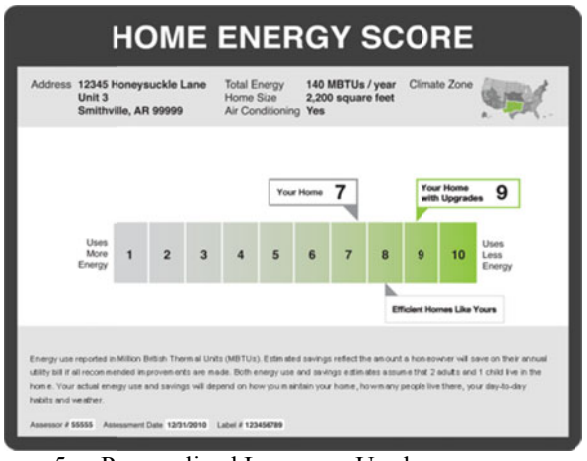
2. Annual Dollar Savings Emphasis



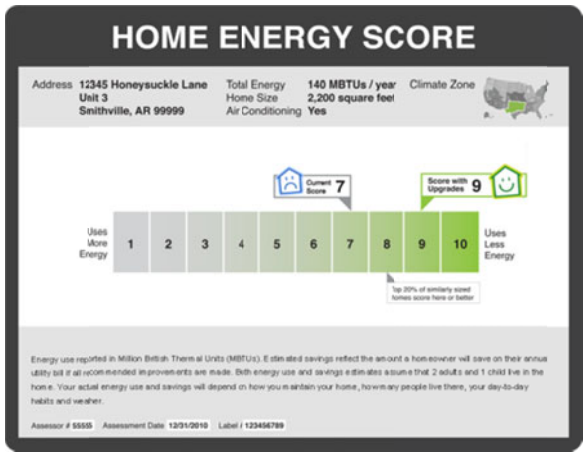
3. Red-Green Color Scheme



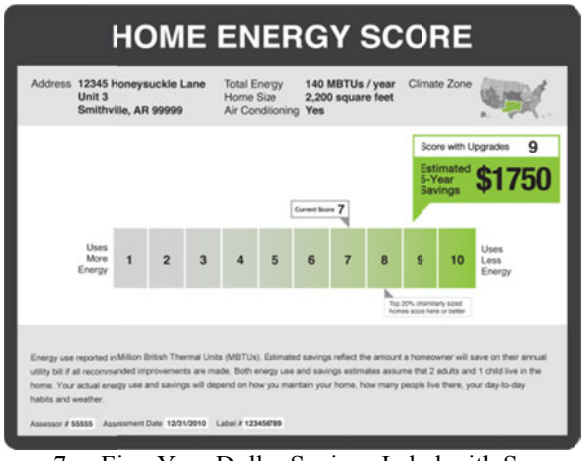
4. Five-Year Dollar Savings Emphasized



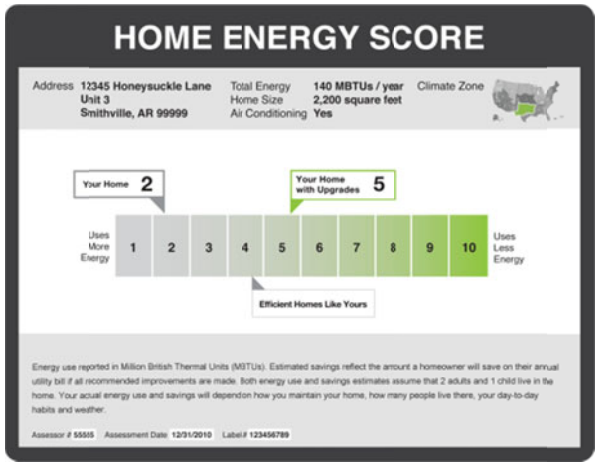
5. Personalized Language Used



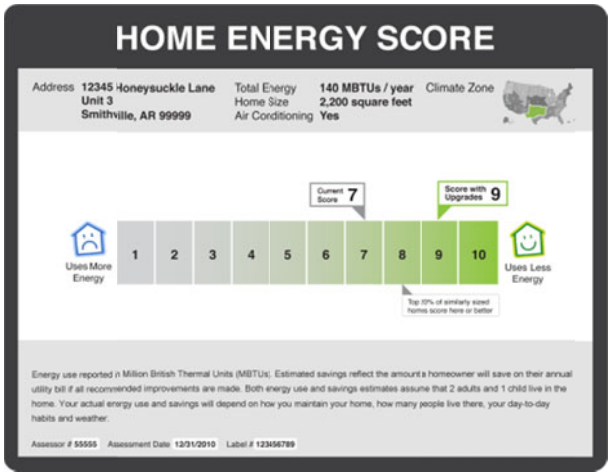
6. "Happy" and "Frowny" Faces Used



7. Five-Year Dollar Savings Label with Score



8. Personalized Language (with 2-5 score)



9. "Happy-Frowny" Faces on Scale

Our initial tests included the baseline and variations 2-6 (Figure 4). A follow-up round was initiated to test variations 7-9 (Figure 4) on a head to head basis vs. winners from the initial round. In order to achieve a faster turn-around for Round 2, we changed the inbound traffic mix to 100 percent Google Adwords/Adsense, which was displayed on contextually relevant pages (as opposed to the untargeted Ad.com buy) and showed higher conversion rates in Round 1. This explains why all conversion rates in Round 2 were higher than in Round 1, even when the same variations were tested (Table 1). Specific conclusions from Round 1 of testing include:

Table 1: Results of Visualization Testing

Round 1: Dec 3-9, 2010	**Total Visitors**	**Conversion**	**Engagement Conversion Rate**	**Compared to Baseline (p-value)**	**Comparing 1 year to 5 year savings (p-value)**
Baseline	126	30	24%		
1-year Dollar Savings	53	13	25%	No winner (1.000)	90% confidence loser
Red to Green	130	45	35%	90% confidence winner (0.074)	
5-year Dollar Savings	120	47	39%	Stat Sig Winner (0.013)	90% confidence winner (0.083)
Happy Frowny Houses	126	51	40%	Stat Sig Winner (0.007)	
Personalized Language	148	56	38%	Stat Sig Winner (0.013)	

Round 2: Dec 10-13, 2010	Total Visitors	Conversions	Engagement Conversion Rate	Performance vs. Pair	
5-year Dollar Saving	118	56	47%	Stat Sig Winner (0.009)	
5-year savings with score	106	32	30%	Stat Sig Loser	
Personalized Language	113	38	34%	No winner (0.576)	
Personalized 2-5	120	36	30%	No winner (0.576)	
Happy frowny house	104	34	33%	No winner (0.890)	
Happy frowny houses on scale	120	41	34%	No winner (0.576)	

Traffic levels varied to different test variations because we rebalanced percent of visitors to each segment once statistically significant conclusions were reached.

- All of the variations we tested performed better than the baseline label, at 90 percent confidence or higher, except for variation 1 (1-year savings, no score), which was not found to be statistically different than the baseline (Table 1).
- At a 90 percent confidence level, we were able to say that showing a five-year dollar savings over an annual dollar savings label is more compelling to homeowners (Table 1).
- Variations 5 (personalized language) and 6 (happy-frowny houses) were also high performers, with variation 6 performing the best out of all variations (Table 1).

Variation 1's similarity to the baseline could have been due to small sample size for that variation which may have limited out ability to detect a difference. Therefore, with more time and a subsequent larger sample size we may have been able to detect an effect of removing the score. The findings in Round 2 (Table 1, discussed below) support this because they suggest that removing the score improves conversion. It is not surprising that homeowners were more interested in a larger dollar figure, but given the multi-year average measure life and average tenure of homeowners and the fact that the larger dollar figure estimate is more compelling, it seems legitimate to show the five-year figure (at least!).

The large increases in conversion for variations 5 and 6 suggests that either personalizing the label (through personalized language and friendly home icons with happy and frowny faces) or simplifying/cleaning-up the display image by removing the savings estimate leads to greater homeowner action. If it is the former, the increased performance suggests that the emotional appeal of the personalization connects with homeowners. If it is the latter, it appears that providing a homeowner only one visualization of savings to focus on may lead to greater homeowner action. It is likely that a combination of these two mechanisms led to the high conversions rates observed for these two variations.

Specific conclusions from the Round 2 of testing included:

- The five-year savings estimate without a score had much greater conversion than the five-year savings estimate with a score (Table 1).

- There was no statistical difference between personalized language with a scores of 7 and 9 and personalized language with scores of 2 and 5 (Table 1).
- There was no statistical difference between thes two happy-frowny house variations (Table 1).

It appears that having only the dollar figure in the savings potential area of the label allows people to focus on the savings that they can achieve without getting distracted about their new score as well. These findings paired with our findings in Round 1 indicate that simplifying or cleaning-up the display image may lead to greater homeowner action.

The lack of statistical difference between higher-scale scores and lower-scale scores is encouraging because it suggests that there is not a "discouragement" factor for people scoring low and only getting to the midpoint of the scale with improvements. However, this cannot be totally ruled out because small sample sizes may have limited our ability to detect a difference, and this study did not include people getting their actual scores and then reacting.

Finally, we were interested in changing the position of the faces to alleviate the potential confusion associated with getting a "frowny" face when the current score is in the mid-range (e.g. not so bad). We had hypothesized that people might not internalize the emotional impact of the "frowny" face in the same way if the faces were at the ends of the scales, but it appears that this is not the case and faces can be used at the ends of the scale. However, we cannot totally rule out the possibility that moving the position of the faces could lead to decreased homeowner action because small sample sizes may have limited our ability to detect an effect.

Based on our quantitative data on conversion rates, we recommended the following combination of visual elements on the final Home Energy Score design to maximize engagement and "emotional tug":

- **Keep it simple**: Simpler, friendlier language and less data always "won".
- **Personalize the "Current Score" indicator so homeowners identify with it**: Either with personalized language ("Your Home") or with a visual icon. Consider removing the numeric score in this box, since the number appears just below the Current Score/Your Home box.
- **Use a five-year savings estimate instead of an annual savings estimate:** As discussed above, it seems legitimate to show the five-year savings figure (at minimum). Given that the five-year savings is a simple total, it would be quite easy to implement this change. Additionally, when using a savings estimate do not also include a "Score with Improvements".

Collectively, these recommendations suggest an implementation that says to a homeowner: "You are here. And a whole bunch of money is waiting for you there. Go get it!"

Email Targeting and Customization

In February 2012, EnergySavvy conducted an email marketing test to determine the most effective ways to use email marketing to reach previously engaged homeowners ("re-marketing"). This test included a targeted subpopulation from all online audit surveys completed on EnergySavvy.com's free homeowner resource site (www.energysavvy.com/home-energy/)

where all those included provided their email addresses and needed insulation (as determined by the survey). Our intent was to test the effect of different messaging strategies, using data from completed Online Audits, on open and click rates (number of emails opened/number of emails sent; number of clicks on hyperlink in email text/number of emails opened, respectively) in a re-marketing email campaign.

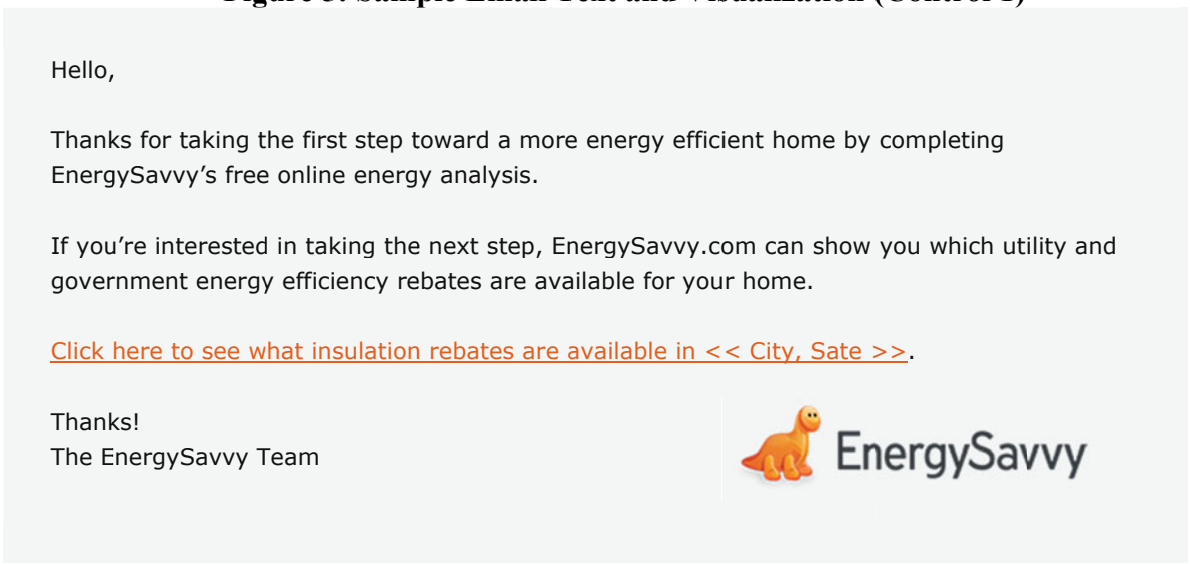
We had two control groups and three test groups each with 365 homeowners. Successful email deliveries varied between groups; therefore, the number of homeowners in each group varied slightly (Control 1: 359; Control 2: 360; Test 1: 363; Test 2: 359; Test 3: 364). Homeowners were randomly assigned to groups, and attributes, such as time since taking survey and age of home were evenly distributed amongst groups; therefore, there was no obvious sampling bias.

The two control groups (Control 1 and Control 2) both included city and state in their subject lines; whereas, the three test groups (Test 1, Test 2, Test 3) included the decade the home was built instead of city and state (Table 2). Test 1, 2 and 3 all used different conversational messaging techniques in the subjects and bodies (Table 2 and 3). All common and dissimilar email attributes are listed in Table 3 and a sample email is shown in Figure 5.

Table 2: Email Subject Text and Subject Word Count

Sample	Subject	Subject Word Count
Control 1	Energy efficiency rebates in City, State	6
Control 2	Energy efficiency rebates for your home in City, State	9
Test 1	Not too late to get energy efficiency rebates for your 19xx's home	12
Test 2	Spending too much money heating your 19xx's home	8
Test 3	Have you insulated the attic in your 1950's home yet?	10

Figure 5: Sample Email Text and Visualization (Control 1)



Subject: Energy efficiency rebates in <<City, State>>Text surrounded by << >> marks was customized based on each user's actual data, as collected in Online Audit

Table 3: Email Body Text and Body Word Count

Sample	Body	Body Word Count
Control 1	• Insulation, city and state included in hyperlink. • Time span not included in text	63
Control 2	• Insulation, city and state included in text and hyperlink • Time span included in text	87
Test 1	• Insulation, city and state included in text and hyperlink • Time span included in text • Text starts with "It's not too late…" • Text includes, "adding insulation could save you money and make your home more comfortable"	97
Test 2	• Insulation, city and state included in text and hyperlink • Time span included in text • Text starts with "Now that the holidays are over…" • Text includes "you could lower your utility bills"	105
Test 3	• Includes city, state, insulation in text and hyperlink • Text includes time span • Text starts with "the new year is upon us…" • Test includes "savings and comfort"	105

Time span values were based on time since survey completion (last year, a few months ago, recently).

Specific conclusions from the test included:

- Overall, Control 1 and Control 2 had the highest open and click rates (Table 4).
- In terms of open rates, Control 1 was extremely statistically different than all the other groups (95% confidence level) (Table 4).
- Control 2 was extremely statistically different than Test 3 (95% confidence level) and very weakly statistically different from Test 1 (90% confidence level) (Table 4).
- Test 1, 2 and 3 were not statistically different from one another (Table 4).
- In terms of click rates, Test 2 was significantly different from Control 1 (95% confidence level) and weakly statistically different from Control 2 (90% confidence level) (Table 4). All other groups were not statistically different from one another.

Table 4: Email Testing Results

Group	Open Rate	Opened Click Rate	Overall Click Rate
Control 1	0.4791^{A}	0.5523^{A}	0.2646
Control 2	0.3667^{B}	0.5227^{A}	0.1917
Test 1	0.3085^{D}	0.4732^{AB}	0.1460
Test 2	0.3091^{BD}	0.3964^{B}	0.1226
Test 3	0.2802^{D}	0.4608^{AB}	0.1291
Total	0.3485	0.4897	0.1706

Chi-square tests were used to conduct pair-wise group comparisons of open and click rates. Different subscripted letters indicate statistical differences at the 90% confidence level or greater and common letters indicate similarities.

In general, succinct email subjects and email bodies performed the best in terms of open and click rates. Our results indicate that program managers should try to keep email subjects within 6-9 words and body text within 60-90 words when constructing email campaigns. Also, replacing city and state in the subject line with a more specific detail (decade of home) appeared to have an unfavorable effect on open rate. This suggests that one has to be careful when including specific details about an email recipient's home. Information like the year a home is built may seem too invasive and make a homeowner feel uncomfortable. Including details like what measures their homes needs may be more favorable.

Additionally, the tone of the subject appeared to have an effect on open rates and more straightforward informative subjects performed better. This could indicate that conversational sentences or questions may be more likely to be perceived as spam sales pitches. Finally, because our test email bodies all included the same information, email tone likely explains any difference in click rates. Our results suggest that providing information with a helpful or suggestive tone rather than telling a homeowner what to do can lead to higher click rates.

Follow-up studies are being conducted in conjunction with CPS Energy of San Antonio, the Utah Home Performance with ENERGY STAR® Program and the City of San Francisco. At least some of these studies will be executed and available by August 2012, and will be provided as supplemental information to this paper at ACEEE.

Optimizing Online Engagement with Home Energy Surveys

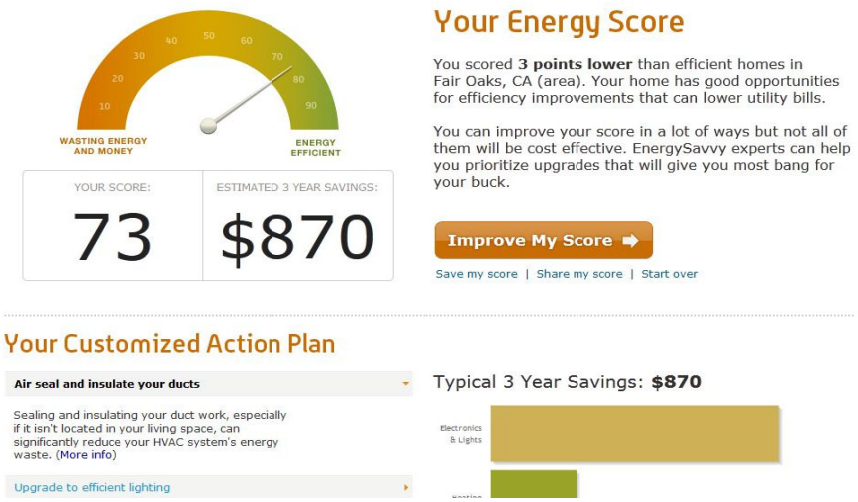
In collaboration with the Energy Trust of Oregon (ETO), and professors at Harvard Business School (Michael Norton) and UCLA's Anderson School (Noah Goldstein), EnergySavvy initiated a research project in March 2012 to examine whether it is possible to boost lead conversion through new online audit results page visualization and messaging. EnergySavvy's Online Audit tool has been deployed within the Energy Trust's website since Fall 2010 (http://oregon.energysavvy.com), so that provides the testing framework for the project.

The proposed methodology (finalized in April and to be executed in May and June 2012) tests the baseline Online Audit experience against different variations:

- **Representing users' energy consumption in terms of a comparable quantity of a physical object** (a barrel of oil or a car being driven for a year). These images can strike different users in ways that may be more likely to produce action, and images often have greater persuasive power in a report than text. However, the impact of a given image may be very different for different users.
- **Grouping the user together with similar neighbors to make a larger social comparison group** (user, user+9, user+99). Sometimes the impact of making a change on one's own is not as motivating as considering one's actions in a larger social context. While the presentation of a result in terms of the user and ten or 100 neighbors can diffuse the responsibility that a single user might feel, it also magnifies the impact that their actions can have and offers opportunities in the future for novel forms of outreach and sharing of the results.

For each of these variables, there may be different effects for different portions of the audience; therefore, we will perform a post-hoc analysis of the impact of various demographic features - primarily associated with geography - on the impact of the changes on users' conversion rates. For example we will look at a user's zip code or address as a proxy for their affiliation with either an urban or rural area, either a "red" or "blue" voting district, etc.

Figure 6: Baseline Online Audit Results Page for Energy Trust of Oregon



A full example results page can be seen at http://oregon.energysavvy.com/report/216ac4bd-683c-4405-898f-1fd9b0d359fd/.

Figure 7: Mock-up of Comparable Quantity Variation Test

Summary

These three studies all examined (or will examine) the effects of design and messaging on homeowner action and, although some our results are specific our implementation, we observed general trends that would be useful to program implementers who are seeking to determine how to best reach homeowners.

There were significant differences in the engagement rates with different visual elements, despite the relative simplicity of the test design. Perhaps the most prevailing trend we observed was that homeowners engaged most with simpler, friendly language and less data always "won". More specifically, providing a user with one piece of data that they can connect to (either through a personalized visualization of their data or one simple value like a dollar) and then act appears to be more effective than providing a user with multiple pieces of information to focus on. Additionally, any visualization that allows for a perception of higher reward (five-year dollar savings versus annual dollar savings) appears to lead to greater homeowner action.

We also observed significant differences in engagement rates with different email messaging and content, and the trend we observed above carries over to email messaging. Straightforward, informative succinct email subjects and bodies with lower word counts lead to greater homeowner action. In general, the less amount of time a recipient has to spend gathering information on how the email can benefit them, the more effective the email appears to be. Also, including personal information in an email subject or body about the recipient's home appears to be beneficial if it is information a homeowner will perceive as relevant, like rebates in their city and state, rather than invasive such as the decade of their home. Finally, email bodies with helpful or suggestive tones rather than telling tones led to greater homeowner action.

References

Ariely, D., 2008. *Predictably Irrational: The Hidden Forces that Shape our Decisions.* New York, N.Y.: HarperCollins Publishers.