When "Not Losing" is Better Than "Winning:" Using Behavioral Science to Drive Customer Investment in Energy Efficiency

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ABSTRACT

To comply with legal mandates and least-cost service obligations, electric and natural gas utilities in the United States increasingly must help their customers save energy. However, motivating customers to make large investments in energy efficiency has been challenging. Existing approaches (incentives, traditional marketing designed to raise awareness of energy efficiency programs) could be augmented with approaches derived from behavioral science to better encourage individuals to purchase, install, and properly use technology.

This paper uses the TITE model: program designers should choose Target behaviors, choose the level of Intervention, determine the Techniques appropriate for changing behavior, implement the program, and Evaluate the results. Particular attention is devoted to exploring techniques that incorporate psychology, design, and behavioral economics insights into utility energy efficiency programs.

Utility Energy Efficiency Programs

Electric and natural gas utilities increasingly help their customers save energy. Over half of the states now have specific energy savings goals. Utilities or third-party organizations responsible for saving energy meet these goals by developing, administering, and implementing portfolios of energy efficiency programs. In 2010, electric and natural gas utilities spent $ 6.6 billion (CEE 2011 Table 1) to administer and provide incentives for energy efficiency programs. Several states that recently implemented energy savings goals – Ohio, Illinois, Indiana, Pennsylvania, and Arizona – are scaling up energy efficiency efforts to levels that would have placed them among leading states a decade ago.

Saving energy is difficult because the energy efficiency opportunity is scattered throughout the economy, in every end-use category, energy efficient solutions often are more expensive on a first-cost basis than inefficient solutions, few in the economy are solely focused on energy efficiency, and savings can be difficult to measure (Choi Granade et al. 2009 ix). Customers face structural, behavioral, and availability barriers to investing in energy efficiency. For example, a tenant may pay a building's energy bills while the owner is responsible for upgrades, a customer may demand a higher return on investment from energy efficiency measures than from other investments of comparable risk, and an energy efficient option might not be available to a customer when she needs it. Energy efficiency programs implemented by utilities and third parties are meant to help customers overcome barriers.

Energy efficiency program managers can use behavioral science to improve energy efficiency programs. To-date, program managers have used behavioral science in a limited manner: mainly to change habitual behavior and the way people operate devices. The most widely adopted of the so-called "behavioral" programs is OPower's home energy reports

program, now offered by more than 60 utilities (Lin 2011). Other than that program – where customers who get the report generally reduce energy use 2 percent, only a portion of the larger "behavioral" energy efficiency opportunity – there have been few large-scale utility efforts to use behavioral science to help people reduce energy waste and optimally operate energy-using devices or processes. There has been even less focus on using behavioral science to drive customer *investment* in energy efficiency. Because the largest part of a utility's energy efficiency budget will continue to be spent helping customers make investments in energy efficient technologies and processes, that is where this paper will focus.

To Increase Investment in Energy Efficiency, Focus on the Context, not the Person

Humans consistently underestimate the power of the environment and the situation in explaining behavior, attributing behavior instead to individuals and their personalities: the "fundamental attribution error" (Ross 1977). In energy efficiency, we see this in the belief that a program manager should raise awareness of or change attitudes about energy efficiency. But in making a decision to invest in energy efficiency, attitudes and awareness are likely not as important as the context in which a customer is making that decision: a market where it is difficult to make the efficient choice. In a survey of Massachusetts residents, personal norms (an attitudinal factor) influenced low-cost conservation actions such as temperature settings; more expensive efficiency improvements were dependent on contextual forces (Black Stern Ellworth 1985 17).

This suggests that energy efficiency program managers could get better results by focusing on removing investment-specific barriers, rather than on increasing awareness of or attitudes about energy efficiency. Hundreds of studies have looked at the correlations between attitudes and behavior, some as early as the 1960's (Wicker 1969). Taken as a whole, these studies suggest that it is considerably more likely attitudes will be unrelated or only slightly related to overt behaviors than attitudes will be closely related to actions. For example, in one study, householders interested in enhancing the energy efficiency of their homes or conserving water participated in comprehensive workshops on residential energy conservation or water conservation. Despite significant changes in knowledge and attitudes, householder's behavior did not change (Geller 1981; Geller, Erickson, and Buttram 1983). In another study, when 500 people were interviewed regarding their personal responsibility for picking up litter, 94% acknowledged responsibility; however, when leaving the interview only 2% picked up litter that had been "planted" by the researcher (Bickman 1972).

This is a complex issue. Sometimes it can be helpful to change a person's internal state – marketing to show that peers engage in the target behavior can be helpful, for example – but program managers should in general focus more on context.

A Framework to Incorporate Behavioral Science into Energy Efficiency Portfolios

How can program managers incorporate behavioral science into energy efficiency portfolios? Dr. Carrie Armel suggests the TITE framework: choose Target behaviors, determine

at what level(s) the Intervention should occur, choose Techniques for changing behavior, implement the program, and Evaluate the results (Armel 2012).

Choose Target Behaviors

Utility energy efficiency programs ideally start with an energy efficiency potential study that identifies technical opportunities to reduce energy use and then analyzes the subset of those energy efficiency improvements that pay for themselves over time in energy savings. The cost-effective energy efficiency opportunities – and the customers who undertake them – should be viewed as the "target behaviors" and "target audience."

To develop a behavior-relevant energy efficiency portfolio, program designers and implementers would determine the barriers that are preventing customers from engaging in the target behavior (such as insulating and sealing their homes). Because people generally have little idea of why they make decisions, tend to confabulate when asked, and often don't know what they *will* want (Kahneman and Thaler 2006), determining barriers is more difficult than asking customers why they don't engage in a particular activity. Program managers can use the design principle of observation instead (Kelley and Littman 2001), determining what is different between those that invest in a particular efficiency improvement and those that choose not to, or comparing the results of programs that attack different sets of barriers. For example, the relative success of retrofit programs that simply provide easy financing or a contractor network can be compared to those that instead provide substantial rebates or little link to contractors. Program designers should put themselves in the role of the customer, asking which steps in the process of making an investment are limiting the behavior. The discussion above may seem obvious, but some potential studies are constructed by asking which of a set of opportunities customers are interested in pursuing, and then basing programs around these points of interest (Black & Veatch 2009). That's backwards. Paraphrasing Steve Jobs, it's not the customer's job to know which efficiency opportunities she wants.

Combine Interventions at Different Levels to Maximize Impact

After selecting targeted behaviors and the barriers keeping the relevant customers from making the energy efficient choice, program managers should determine the level(s) at which an intervention should take place. The concept of levels is borrowed from the public health field, which has used it recently to combat heart disease and smoking. There are five levels relevant to energy efficiency behavior, the *channels* through which program managers can influence behavior

- Interpersonal: face-to-face contact, often involving a neighbor, trusted leader, or an expert (such as a trained energy auditor)
- Sociocultural: information in the culture, such as media and marketing
- Market: where people make buying and selling decisions relevant to the target behavior, such as paying incentives to retailers to stock and sell efficient lighting
- Policy: a rule or law, such as building codes and appliance standards
- Physical environment: characteristics of technology or the built environment itself (Armel 2007)

There are many interactions between levels: for example, interpersonal interactions or media campaigns could lead to policy change. Interventions that occur at multiple levels are more likely to be successful than interventions at only one level. A program designer aiming to increase the penetration of retrocommissioning could thus promote the program through outreach to building operators at their annual conference (interpersonal), develop a case study based on the work of an early adopter (sociocultural), and design an incentive to encourage retrocommissioning (market). A utility could also get savings credit for helping to pass a state policy encouraging retrocommissioning (policy).

Choose Techniques for Changing Behavior

After determining at what levels the intervention should occur given target behavior-specific barriers, program designers choose techniques for changing the target behavior. The fields of design, behavioral economics, and psychology have all generated insights that could be better-applied to energy efficiency programs. Examples of using these insights are described below.

Make your program "usable." Customers are often surprised at the complexity of utility energy efficiency programs: an energy efficient choice does not necessarily lead to an immediate rebate. While some administrative complexity is necessary to ensure the entire utility customer base is paying for well-installed efficiency measures, program designers can use human-centered design principles to make programs more understandable. To be "usable," a program should:

- Make its relevant parts visible. When encountering an energy efficient program (on a website, in a conversation with an account representative, on the back of a case study), a potential participant should be able to understand the alternatives for action, where to begin, their current position in the program workflow, and the various steps between when she first encounters the program and final evaluation.
- Be based on a good conceptual model: a user should understand the rationale for the program and the relationship between actions and results. Program designers should explain and seek to minimize situations where a particular action will generate a result a naïve customer would not understand (for example, by explaining restrictive eligibility requirements).
- Give the participant immediate feedback about the results of their actions and their position in the program workflow (Norman 2002).

Overcome the endowment effect. The mere fact of ownership makes it painful for customers to part with items they've already paid for, even if that item is inefficient and it makes financial sense to replace it with something better. Behavioral economists call this the "endowment effect." This has been tested empirically in comparing "willingness to pay" and "willingness to accept" for various environmental travesties. When told that a developer is seeking to buy the right to develop a giant waterslide at the Grand Canyon, and asked to name a price, the price people demand (if there is even a price they will accept) is much higher than the corresponding price to retire the right once it has already been given to the developer (Kahneman, Knetsch, and Thaler 1991).

Related to energy efficiency, the endowment effect means that early replacement programs operate at a significant psychological disadvantage. One way to overcome this

disadvantage is to acknowledge the old device in program marketing, and state that, even including sunk costs, a customer is losing money by not upgrading to the efficient option. Programs can take advantage of the endowment effect by targeting program efforts at points in time when the endowment effect is suspended, like just after a home is sold, or when a customer is in the market for a new device.

Use framing to your advantage. The way information is presented – framing – can also have strong effects on behavior. Three robust cognitive biases framing can take advantage of are loss aversion, the percentage bias, and reference dependence. Loss aversion means that people focus on losses much more than on gains. When given a choice between surgery and radiation therapy, describing surgical outcome statistics as a 90% survival rate led more people to choose surgeries than when survival was described as a 10% mortality rate (McNeil et al. 1982). Program managers should test whether loss avoidance messaging works: a customer may be more willing to get rid of a second refrigerator that is "costing him $100 a year." Another effect, the percentage bias means that people think of gains and losses in terms of percentages rather than absolute numbers. Thus, a bulb that "cuts your lighting expenses by 75%" will be more compelling to a customer than the same bulb that saves you "three dollars per month." Finally, reference dependence means that people judge their well-being relative to some reference point, which could be what they expect, what they have habitually experienced, or what other people are doing (Kahneman 1979). With energy use, the reference point to which a customer's energy use is compared should thus be to his "efficient neighbors," or a 10% reduction from last year's consumption. People can be primed to accept different numbers as reference points. Retailer-based programs could train sales staff to always show the efficient option first within a product category, and then present the option that costs less but uses more energy.

Make energy efficiency the default choice. Utilities and regional efficiency organizations should explore efforts that make efficiency the default choice. Simply switching a program from opt-in (where the default is non-enrollment in the program) to opt-out (where the default is enrollment in the program) can have a large impact on program enrollment, even though the available options have not changed (Kahneman, Knetsch, and Thaler 1991). For example, in countries where the default option is to donate organs (presumed consent), participation rates are 25-30% higher than countries in which not donating is the default (informed consent), controlling for other factors (Abadie and Gay 2006). Similarly, employee participation in 401(k) plans increase from 37% to 86% under automatic enrollment (Madrian and Shea 2001). There are several reasons why defaults are effective: they require no additional effort, people believe that there may be good reason for the default and do not want to risk making an error, and individuals tend to copy norms. In energy efficiency, utilities can employ defaults by helping to develop and ensure compliance with appliance and device efficiency standards and building codes, and also by working with major manufacturers or industry associations to make all products more efficient.

Curate choices. Too much choice can be de-motivating. Grocery store shoppers presented with 6 jam varieties to sample ended up buying much more jam than customers presented with 24 jam varieties, even though fewer shoppers stopped to try jam when there were 6 choices (Iyengar and Lepper 2000). Also, as choices increase, the desirability of the status quo increases (Kahneman, Knetsch, and Thaler 1991). Program managers can overcome this by curating choices: presenting

three different retrofit "packages" instead of a menu of options. The fast-innovating lighting market could also use curation. Customers could buy a package of efficient lights appropriate for the various lighting needs in the home: bathroom vanity, outdoor, reading lights, table lamps, etc.

Reward customers upfront. Unfortunately, the "fundamental attribute" of energy efficiency – that energy efficiency opportunities often require customers to invest more money upfront to save (an uncertain amount of) money and energy over time – creates barriers to behavior change. People exhibit what behavioral economists call a "first cost bias:" they generally prefer to purchase a less expensive light bulb, refrigerator, car, or other item up front, even when a more efficient one with a higher first cost would save them money in the long run. Similarly, people sometimes avoid purchasing items like home energy improvements altogether, because of the up-front cost, even though they would recoup the cost over time. Another effect: in valuing benefits that accrue over time, people do not use a linear discount rate: that is, they are systematically biased in that they value immediate rewards (and dislike immediate costs) *much* more than they value future rewards (and dislike future costs), to a degree that is not explainable by any reasonable discount rate (Thaler 1981). A person's discount rate depends on the magnitude of what is being discounted (discount rates are higher for small rewards), the sign of what is being discounted (reward or penalty), and whether the future costs and benefits induce "savoring or dread." People need to be paid a lot to wait for a reward, but are not willing to pay very much to delay a fine (Lowenstein and Thaler 1989). Also, people also treat opportunity costs (foregone benefits) differently that out-of-pocket costs. Taken together, these anomalies put energy efficiency – where costs are incurred upfront for an uncertain future small benefit – at a disadvantage compared to other things a customer can spend money on.

Program designers can overcome these behavioral barriers by pulling future savings to the present and increasing the certainty of savings. If a customer were able to get some portion of their energy bill savings when they purchase an efficient item, in cash or as a discount to the purchase price, energy efficiency opportunities would be fundamentally more attractive, even if the upfront savings were paid back over time. The rollout of smart meters means the baseline from which savings are measured could be granular and specific to the customer, but even that isn't necessary: savings could be deemed (based on an agreed-upon value from engineering estimates and market assessments). Rebates of course partially accomplish the "pulling forward" of savings, but they are usually designed to pay for some portion of the incremental cost of an item, not to pull forward bill savings to the present. Program designers should also experiment with offering "guaranteed savings" similar to those offered in the ESCO market.

Use competition and rewards, and reciprocity, instead of small monetary incentives. Monetary incentives are used routinely to overcome the first cost bias and motivate customers to invest in energy efficiency, but they should be used carefully, because they can "crowd out" internal motivation to perform an action that is morally correct or creates social esteem. For example, offering people $7 to donate blood actually decreases blood donation (Mellstrom and Johannesson 2008). In energy efficiency, this decrease in internal motivation inhibit market transformation that would otherwise let program mangers decrease incentives over time. Small incentives that are invisible to the consumer (incentives paid to retailers and manufacturers) are thus better from a behavioral perspective than small incentives given directly to the consumer.

As an alternative to small monetary incentives, program designers can explore using competition and rewards to motivate customers. A randomly selected customer among those who

make home energy improvements (or buy an LED lighting package) could win $10,000, new counter-tops, or stainless steel energy efficiency appliances, for example. This would potentially be effective because people overestimate their chance of winning, and also undervalue small, piece-rate rewards (such as the initial discount and savings that come from long-lived efficiency investments). If barriers suggest a community-based interpersonal-level intervention (perhaps for a neighborhood or commercial strip retrofit), program managers should explore rewards based on the performance of the community, rather than individual rewards. Community based rewards have a tendency to increase the effort of participants (Fehr and Falk 2002). Program designers should be careful, however, to not label energy efficiency behaviors "extreme" (no "extreme makeover" home retrofit).

Another effect, reciprocity, means that people repay trust and gifts with high effort, sometimes even more so than if they are offered rewards that are contingent on the amount of effort produced. For example, doctors were less likely to return a voluntary questionnaire if they were given a check to be cashed only upon completion rather than a check that could be cashed regardless of completion (Fehr and Falk 2002). As an alternative to a small monetary incentive, program designers should test using a nominal price gift to induce participation: a tree or small houseplant accompanied by an invitation to attend a community workshop on home energy improvements, for example, could be effective.

Interpersonal interventions and communal feedback. Some of the techniques listed above are especially effective in interpersonal interventions, which use face-to-face contact, whether from friends, block leaders, or representatives of community-based organizations. Face-to-face contact is very effective since programs are catered to the user, modeling is done by someone in close proximity to the user, the kind of information used is specific to the situation, and the citizen has a direct learning experience.

An example of a successful interpersonal intervention is the Hood River weatherization project, undertaken by NRDC and the Pacific Northwest's electricity suppliers. Initially, less than 10% of customers signed up for the program. However, when the project switched to relying heavily on local residents, such as speakers at schools and churches, 85% enrolled in 2 years, and 95% by the end. (Cavanagh and Hirst, 1987).Some techniques – such as goal-setting, feedback, and facilitated practice – can be especially effective in an interpersonal approach.

One of the problems with energy efficiency is that individuals wonder why they should bother changing their behavior because alone they won't make a big difference. However, this can in part be addressed with communal feedback. When residents of the Midland-Odessa area in Texas were provided with daily evening television feedback and conservation tips, they reduced gasoline usage by 32%, and usage remained at 15% lower several months after the program compared to what it had been prior (Rothstein 1980). In energy efficiency, a community-wide goal to purchase more LED light bulbs could be coupled with television feedback.

Evaluate the Results

After running a program incorporating the above techniques, it is of course important to evaluate the results and incorporate insights into future programs. Evaluation should be considered as programs are designed, and program designers should if possible design the program so that results will be robust: by using a test and control group, for example.

Conclusion

Utilities are currently spending nearly $10 billion per year to help customers save energy. This effort could be made more effective by incorporating behavioral science into utility energy efficiency program design, implementation, and evaluation. Rather than focusing on changing attitudes about or awareness of energy efficiency, program managers should focus on changing the context in which customers make decisions to invest in energy-using devices or processes. To do this, program managers should choose target behaviors and audiences, choose the levels at which they will attempt to reach customers, choose techniques based on behavioral science, implement the program and evaluate the results.

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