

Behavior Insights and Tools

How Social Science Has Been—and Could Be—Applied to Connected Programs



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- Alliance to Save Energy
- BC Hydro
- Baltimore Gas and Electric
- Cape Light Compact
- DTE Energy
- Efficiency Vermont
- Energy Trust of Oregon
- FortisBC
- Southern California Edison
- Oncor
- Pacific Gas and Electric
- Puget Sound Energy
- Sacramento Municipal Utility District
- San Diego Gas & Electric
- Wisconsin Focus on Energy

1 Introduction

1.1 Background

While there is growing interest in enhancing savings through behavior change by applying social science insights to efficiency programs, there is a great deal of uncertainty about how to go about this, particularly considering the constraints of the regulatory environment.

This challenge has been compounded by the fact that many assumptions about what changes behavior have been shown to be incorrect or inadequate. Despite longstanding research to the contrary, it is sometimes still assumed that people will make energy efficient decisions when it's in their long-term financial interest to do so.¹ Similarly, it has traditionally been assumed that people make decisions about their energy consumption that best maximize the benefits and minimize the drawbacks to them; however, in practice, people rarely make energy use decisions this way.^{2,3}

Understanding scientific research on human behavior is a key first step to addressing the true motivating factors that impact behavior and can greatly help in successfully achieving behavior change in energy efficiency programs.

Fortunately, a variety of fields outside the energy efficiency industry—including psychology, sociology, and public health, among others—are conducting research and have accumulated a wealth of wisdom on the key factors that do in fact help change behavior. In order to make better use of the research already in existence, in 2010 members of the CEE Behavior Committee and CEE staff put together an overview of some of the key insights into human behavior that social science has gathered over the years, with tangible examples of how this knowledge is being applied.

Recently, the Behavior Committee took a closer look at these existing behavior insights through the lens of connected, with the goal of updating this document to reflect how the feedback provided by connected technologies might be effectively combined with behavioral insights. As a result, in 2015 CEE published this revised overview to acknowledge the increasing prominence of pilots and programs featuring connected technology and to specifically address how these behavior insights can be effectively leveraged with new technologies.

1.2 Purpose

The purpose of this document is to provide program administrators with an overview of some of the main insights into human behavior that social science has gathered over the years, with tangible examples of how this knowledge is being applied in connected pilots and programs. This information is designed to aid CEE members in applying behavior insights to increase the effectiveness of their current and planned connected programs and assist with the development of innovative new program designs. Additionally, the insights about messaging and framing are intended to aid program marketers as they work to increase the uptake of existing programs.

Throughout this document, when we refer to connected pilots and programs, we’re referring to efforts that incorporate at least one connected product. Connected products are products engineered to send and receive specific information with a specific purpose to enable new streams of value to both utilities and customers and contribute the necessary data to customer engagement platforms that enables end users to capitalize on these new value streams. While CEE is pursuing definitions of connectivity to benefit both utilities and consumers, when we refer to connected in this document, the focus is on the customer facing platforms and opportunities for engagement. While these types of technologies are often found in residential applications, this document is intended to be applicable to pilots and programs in all sectors.

Nearly all of these social science insights could be effectively applied to programs that include connected technology, yet not all of them have been to date. This document aims to facilitate the incorporation of new behavior change insights into programs that include two-way technology.

1.3 Overview

This document is divided into three main sections: Behavior Insights and Tools, Most Applied and Most Applicable, and Program Examples.

The first, [Behavior Insights and Tools](#), provides an overview of human behavior principles from the social sciences. The insights themselves are the same as those published in the 2010 document, with the addition of [Gamification](#), a description of which can be found in the Rewarding Behavior Change section of the document.

We have organized these insights into five categories:

- [Framing Efficiency to Promote Behavior Change](#)
- [Overcoming Natural Decision-Making Preferences](#)
- [Emphasizing Person-to-Person Interaction](#)
- [Rewarding Behavior Change](#)
- [Achieving Follow Through](#)

The insights described fit within these categories:

Framing Efficiency to Promote Behavior Change

Anchor Bias	Extremeness Aversion	Perceived Benefits and Drawbacks
Choice Overload	Feedback	Relativity
Cognitive Dissonance	Foot-in-the-Door Technique	Self-Efficacy
Existing Values	Loss Aversion	Status Quo Bias
		Sunk Costs

Overcoming Natural Decision Making Preferences

Above Average Effect, Illusory Superiority	Elimination Heuristic	Representativeness Heuristic
Availability Heuristic	Heuristics	Single Action Bias
Confirmation Bias	Knowledge-Attitude-Behavior Gap	
Discounting the Future	Recognition Heuristic	

Emphasizing Person-to-Person Interaction

Competition	Interpersonal Communication	Reciprocal Concessions
Fairness, Inequality and Punishment	Messenger	Social Norms
	Modeling Behavior	

Rewarding Behavior Change

Crowding Out	In-Kind Gifts
Endowment Effect	Reciprocity Rule
Gamification	

Achieving Follow Through

External Barriers	Public Commitment
Goal Setting	Prompts
Priming	

We recognize that many of the insights listed here could fit into multiple categories. For the sake of simplicity, we have assigned each insight to only one category, but have linked insights to each other to emphasize the connections among related concepts.

The second, [Most Applied and Most Applicable](#), outlines the behavioral insights—such as prompts, social norms, and loss aversion—that have been more commonly applied to pilots that include connected technology, and may especially lend themselves to this application.

Given that behavior change is still an evolving field, the social science research occasionally seems to contradict itself. While this is an ongoing challenge, we have attempted to note these contradictions throughout this document and acknowledge that there are certain aspects of human behavior that are still not fully understood or that may vary by context or culture, the latter of which this document does not attempt to address.

The third, [Program Examples](#), includes more detail on each of the programs that were provided as examples in the previous two sections of this document. Wherever possible, we included a connected pilot or program example for each insight; however,

because this is a new area, there are also insights that only programs without a connected component have incorporated, at least to our knowledge. Program examples were identified through the [CEE Behavior Program Summary](#)¹, Behavior, Energy & Climate Change (BECC) Conference Proceedings, as well as reaching out to members with relevant pilots and programs. The program examples provided here are not intended to be comprehensive; there are likely other CEE member pilots and programs that both include connected technologies and apply these insights.

1.4 Future Opportunities

As previously mentioned, this collection of Behavior Insights and Tools is based on an original version of this document published in 2010 and will likely continue to evolve over time as CEE members apply new insights from the social sciences to new program types. If you are running a program that incorporates one or more of these insights and wish to share this information with other CEE members in future versions of this document, please contact us at kashby@cee1.org.

2 Behavior Insights and Tools

The following sections provide an overview of human behavior principles from the social sciences. For each insight, any alternate names we have come across for the insight are provided, as is a very brief description of the concept, the implications for energy efficiency specifically, any related concepts found elsewhere in this document, and where available, links to descriptions of CEE member programs that have incorporated this insight.

2.1 Framing Efficiency to Promote Behavior Change

The behavior insights included in this section describe the importance of context and how messages are framed and presented. The same information presented in different ways can have a very different impact on the target audience and, consequently, completely disparate results in terms of behavior change, or lack thereof. The approaches described below illustrate how anchoring information within certain contexts, framing choices as avoiding losses rather than accruing gains, and limiting the number of options presented all possess the power to make a behavior change message more compelling.

Anchor Bias	
Explanation	Anchor bias describes the fact that people are influenced by the starting point or context that is provided with new information. ^{4,5} For example, the Manufacturer’s Suggested Retail Price (MSRP) for new car sales is an anchor because it’s the first price a potential car buyer sees; all other price

¹If you do not already have access to the CEE Forum, please contact Casey Erisman at cerisman@cee1.org for a username and password.

	offers the dealer makes will be viewed in comparison to that initial higher price. ⁶
Efficiency Implications	Telling a customer how much energy they are using may have very different effects depending on what other information is provided for comparison. For example, if their current energy use is compared to their higher use from the same time last year, their current energy use will seem low, even if it's high compared to other anchors, such as the average use for that neighborhood during the same season.
Program Examples	SmartPricing Options (SMUD) Smart Thermostat Pilot (PG&E)
Related Concepts	Relativity, Extremeness Aversion, Elimination Heuristic

Choice Overload	
Also known as	Bounded Rationality; Choice Paradox
Explanation	People have a limited ability to make decisions when faced with many options that have variable benefits and drawbacks. ⁷ When faced with too many choices, people tend to become overwhelmed and are less likely to make the optimal choice or make any decision at all than they would be if they were presented with fewer choices. ⁸
Efficiency Implications	Providing customers with only a few ways they can reduce their energy use may be more effective than providing a longer, more complete list.
Related Concepts	Status Quo Bias

Cognitive Dissonance	
Explanation	Cognitive dissonance refers to the fact that people try to avoid clashes between their actions and how they view themselves. ⁹ As a result, people are more likely to change their behavior when they are shown that their actions don't line up with what they say they believe. ¹⁰ People tend to align their beliefs and attitudes with their actions more than the reverse, meaning you can sometimes change someone's attitude towards a behavior by first getting them to perform that behavior. ¹¹
Efficiency Implications	If an individual is asked whether they are energy efficient and they answer affirmatively and then they are asked whether they use CFLs or LEDs, and they have to answer no, the individual might be prompted to take action to change their light bulbs since there is a disconnect between their self-perceptions and their behaviors. Similarly, once an individual makes a small change such as installing a CFL, she may begin to see herself as more energy efficient in general and may be more likely to take additional energy efficiency

	steps.
Program Example	Rock the Bulb
Related Concepts	Foot-in-the-Door Technique , Crowding Out

Existing Values	
Explanation	Existing values, or what is most important to an individual, can play a key role in how he or she views a potential behavior. ¹²
Efficiency Implications	Depending on the target audience, the same energy efficient behavior can be achieved by appealing to different values, such as furthering the common good, preserving nature, social responsibility, ethics, religion, etc.

Extremeness Aversion	
Also known as	Compromise Effect
Explanation	Extremeness aversion means that people tend to avoid the most extreme options in favor of a choice that appears to be more moderate. ^{13,14} For instance, people tend to avoid purchasing the cheapest or most expensive item on a menu.
Efficiency Implications	Describing the choice you hope customers make as a moderate option or a compromise, as opposed to the least or most an individual could do to improve their home's efficiency, may make behavior change more likely.
Program Example	DTE Insight Smartphone App (DTE Energy)
Related Concepts	Anchor Bias , Relativity , Elimination Heuristic , Reciprocal Concessions

Feedback	
Explanation	In the energy efficiency context, providing feedback means giving people information on their energy use or related costs. Feedback is generally more effective when it is given frequently, timed to decision points, and provided as soon as possible after the target behavior. ¹⁵
Efficiency Implications	Frequent, direct feedback that also provides an alert, such as a cautionary red light, when customers are using particularly high amounts of energy may be most effective in reducing energy consumption. ¹⁶
Program Examples	Home and Business Area Network (Pacific Gas and Electric) Smart Energy Manager (Baltimore Gas & Electric) Smart Home Energy Monitoring Pilot (Cape Light Compact) Smart Thermostat Pilot (Pacific Gas and Electric) DTE Insight Smartphone App (DTE Energy)

	Continuous Energy Improvement (Efficiency Vermont)
Related Concepts	Social Norms, Extremeness Aversion, Cognitive Dissonance

Foot-in-the-Door Technique	
Also known as	Small Concessions
Explanation	The Foot-in-the-Door Technique refers to the observation that people are much more likely to agree to make a big change if they are first asked to make a small change. ¹⁷ Making small energy efficiency changes can help people view themselves as more energy efficient individuals in general, which may make them more likely to make larger energy efficiency improvements in the future. ¹⁸ That said, the Single Action Bias tells us that people may also be less likely to take additional action once they've done one thing, unless that first action is followed up with requests for future actions.
Efficiency Implications	Convincing someone to make a small energy efficiency change, such as sealing a few attic leaks, may make him more likely to make a larger change in the future, such as installing new insulation throughout his home.
Program Example	The 20/20 Challenge (FortisBC)
Related Concepts	Cognitive Dissonance

Loss Aversion	
Explanation	Because people are loss averse, they generally prefer to miss out on something they could have gained rather than lose something they already have. ¹⁹ Loss aversion is strong enough that people tend to prefer to take a risk that they'll lose a lot rather than be guaranteed a small loss. ²⁰
Efficiency Implications	Energy efficiency audits may be more effective if the efficiency improvement recommendations are framed in terms of avoided energy and money losses rather than future savings. ²¹
Program Examples	Home and Business Area Network (Pacific Gas and Electric) Smart Thermostat Pilot (Pacific Gas and Electric)
Related Concepts	Status Quo Bias, Endowment Effect

Perceived Benefits and Drawbacks	
Explanation	In deciding whether to change their behavior, individuals unconsciously balance the benefits and drawbacks they perceive will result from a new behavior and a competing behavior, for example, purchasing the more efficient product, versus opting for the cheaper, less efficient model. ²² The order in which information about potential benefits and

	drawbacks of an action is provided is important. If you first admit a drawback, then go on to list the benefits, you will gain the trust of your audience and they will be more willing to focus on the benefits of the new behavior than if the order is reversed. ²³
Efficiency Implications	In framing an efficiency program, emphasize the benefits and minimize the drawbacks of the target behavior or what you want them to do, while emphasizing the drawbacks and minimizing the benefits of the competing behavior or what they're doing now. At the same time, be sure to be upfront about the drawbacks early.
Program Example	Rock the Bulb (Puget Sound Energy)
Related Concepts	Loss Aversion

Relativity	
Explanation	Relativity describes how people handle decision making when faced with several choices that are similar and another option that has no comparison. ²⁴ When people are given three choices, two of which are similar, they are significantly more likely to choose the more attractive of the two similar choices and avoid the choice that has no comparison. ²⁵
Efficiency Implications	When framing efficiency options, aim to strategically include similar comparisons to the behavior you're trying to encourage.
Related Concepts	Anchor Bias

Self-Efficacy	
Also known as	Perceived Control
Explanation	Self-efficacy refers to whether people think a given behavior change is possible for them, for example, can they afford a more efficient water heater? Do they have the ability to make changes in their home if they are a tenant? Will the change accomplish the desired goal of saving energy or money, or increasing comfort? ²⁶ Behavior change of any kind is unlikely to happen without self-efficacy because people have to perceive that change is possible and would be effective before they want to try to change.
Efficiency Implications	Program participation may benefit from illustrating how an individual's small changes are both doable and result in energy and monetary savings.
Program Examples	Manage-Act-Save (San Diego Gas & Electric) Continuous Energy Improvement Pilot (Efficiency Vermont) Smart Home Energy Monitoring Pilot (Cape Light Compact)

Status Quo Bias	
Also known as	Default Bias
Explanation	The status quo bias refers to people’s preference for the default option when they are presented with more than one choice, ²⁷ since going with the default is easiest and requires no decision. ²⁸ The status quo bias explains the success of opt-out programs, which automatically enroll participants unless they specifically request otherwise. This approach has also been very successful both in encouraging employees to save for retirement and increasing organ donations.
Efficiency Implications	Requiring customers to opt-out of an efficiency program likely improves participation, possibly by a lot, but may upset a few customers.
Program Examples	iCanConserve (Focus on Energy) Smart Energy Rewards (Baltimore Gas & Electric) Nest Thermostat Heat Pump Control Pilot (Energy Trust of Oregon) Manage-Act-Save (San Diego Gas and Electric)
Related Concepts	Loss Aversion , Choice Overload , Anchor Bias

Sunk Costs	
Explanation	Sunk costs are resources that have already been used up and cannot be recovered. In making decisions about the future, people tend to take into account how much they have already spent on related items or services. ^{29,30} For example, if someone spends money to repair a car and then the car needs a more expensive repair soon thereafter, the owner will be more likely to try to repair the car again than if he or she hadn’t just sunk money into the previous car repairs.
Efficiency Implications	People tend to hold on to inefficient appliances until the benefits of replacing them are much larger than the costs of the new appliances. Incentives that reduce the cost of new, more efficient equipment might help overcome this tendency.
Program Example	Rock the Bulb (Puget Sound Energy)
Related Concepts	Cognitive Dissonance , Status Quo Bias , Endowment Effect

2.2 Overcoming Natural Decision Making Preferences

The behavior insights included in this section outline the ways in which people’s natural tendencies in assessing information and using it to make decisions can predispose them to make certain decisions over others. Mental shortcuts used in decision making may save time, but they rarely serve the cause of energy efficiency and

sometimes result in decision making that is factually flawed. The behavioral insights and examples in this section detail these particular pitfalls and shed some light on how they might be avoided.

Above Average Effect / Illusory Superiority	
Also known as	Illusory Superiority, Optimistic Overconfidence
Explanation	The Above Average Effect describes the fact that people tend to be unrealistically optimistic about their own abilities and their chances of obtaining positive results compared to how they view other people’s abilities and chances. ^{31,32}
Efficiency Implications	People tend to think that issues such as global climate change only impact others. Similarly, people tend to believe that they are better at conserving energy than the average person, even if this is not the case.
Program Example(s)	Manage-Act-Save (San Diego Gas & Electric)
Related Concepts	Lotteries , Self-Efficacy , Social Norms , Competition

Availability Heuristic	
Explanation	The availability heuristic is a mental shortcut people take that leads them to estimate how common or likely a situation is by how easily examples of that situation come to mind—that is, how “available” the examples are. ^{33,34} This means that people overestimate the chances of rare events that happened recently and those that were particularly memorable, even though the most memorable events may have been memorable because they were unique.
Efficiency Implications	Telling memorable and meaningful stories about people the target audience knows who have saved money by taking specific efficiency actions may be helpful in changing the target audience’s behavior. Similarly, using familiar people in the media to endorse the target behavior may also be effective.
Program Examples	Smart Home Energy Monitoring Pilot (Cape Light Compact) Rock the Bulb (Puget Sound Energy)
Related Concepts	Heuristics , Messenger

Confirmation Bias	
Explanation	The confirmation bias describes people’s tendency to seek out and more readily accept information that lines up with their existing beliefs rather than to change their beliefs based on new information. ³⁵ This bias describes the fact that when someone is presented with information that contradicts a strongly held belief, the natural tendency is to discredit the evidence or its source rather than to reconsider the fundamental belief; the result is that people sometimes

	end up more entrenched in a specific belief after being presented with contradictory evidence.
Efficiency Implications	It may be more effective to focus your program efforts on segments of your target audience that already view energy efficiency positively than to try to convince those who don't. Alternatively, it may be useful to frame your message so that it appeals to the target audience's existing values, rather than trying to change their beliefs.
Program Example	Home and Business Area Network (Pacific Gas & Electric)
Related Concepts	Status Quo Bias , Cognitive Dissonance , Existing Values

Discounting the Future	
Also known as	Time Inconsistency, First-Cost Bias, Hyperbolic Discounting
Explanation	Because people discount the future, they will tend to choose a lower cost option now, even if this means they will pay more long-term. ³⁶ Overall, people tend to place too little value on long-term benefits and too much value on long-term costs and first costs. ³⁷
Efficiency Implications	On-bill financing and incremental first cost incentives both apply to this approach. Another way to get around this preference might be to reimburse a utility customer at the time he purchases a more efficient appliance for the amount he paid over and above the price of the less efficient option, while still requiring the customer to pay off the difference at a later date.
Program Examples	Home and Business Area Network (Pacific Gas and Electric) Smart Pricing Options (SMUD) iCanConserve (Focus on Energy) Nest Thermostat Heat Pump Control Pilot (Energy Trust of Oregon) DTE Insight Smartphone App (DTE Energy) Smart Energy Manager (Baltimore Gas and Electric) IHD Check out Pilot (SMUD)

Elimination Heuristic	
Explanation	Due to the elimination heuristic, people given many options tend to narrow down their choices by quickly eliminating several that seem to be the worst in one specific way, for example by eliminating the two most expensive options. ^{38,39}
Efficiency Implications	It may be helpful to frame the choice you hope customers make as moderate. For example, giving people several more expensive and several less expensive options makes the target option seem particularly reasonable.

Related Concepts	Heuristics , Extremeness Aversion , Anchor Bias
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Heuristics	
Explanation	Many decisions are made by unconscious rules of thumb. Heuristics is the collective term for the different shortcuts we take in using what we know about the world—or think we know—to make quick decisions. ^{40,41} It is due in part to heuristics that people tend to stick to their usual habits and are unlikely to change their behavior. Specific heuristics are listed throughout this section.
Efficiency Implications	Whether or not someone turns off a light when leaving a room may be difficult to change since it's a habit that has formed over a number of years.
Related Concepts	Availability Heuristic , Elimination Heuristic , Recognition Heuristic , Representativeness Heuristic , Status Quo Bias

Knowledge-Attitude-Behavior Gap	
Explanation	Numerous studies have shown that simply providing information about energy conservation often has no impact on energy use behavior. ^{42,43} Neither increasing people's knowledge nor shifting their attitudes <i>directly</i> leads to behavior change. ^{44,45,46} Awareness of an issue is only the first step necessary to change behavior and does not by itself lead to an individual testing out, and possibly eventually adopting, a new behavior. ⁴⁷ Several other elements, such as values, beliefs, and external barriers, need to be addressed before a change in knowledge or attitude can be expected to lead to a change in a specific behavior in some segment of a given target audience. Moreover, some research indicates that people's attitudes are shaped at least in part by how they behave, which only emphasizes how changing attitudes isn't enough to change behavior. ^{48,49}
Efficiency Implications	If the goal of a program is to change energy consumption behavior through providing information or education, the program design should include an articulation of the underlying values, beliefs, and external barriers that also need to change in order for a change in knowledge or attitudes to lead to a change in behavior. Plans should be made to address each of these in the program. In addition, very specific behaviors must be targeted for change. Other insights provided in this document should also be assessed for their applicability to the effort.
Related Concepts	Cognitive Dissonance

Recognition Heuristic

Explanation	When people are given more than one choice, they tend to choose what's familiar, what they recognize, which is often what they have chosen in the past. ^{50,51}
Efficiency Implications	More efficient behaviors and products need to become familiar before people are likely to choose them.
Program Example	Smart Energy Manager (Baltimore Gas & Electric)
Related Concepts	Heuristics , Status Quo Bias

Representativeness Heuristic	
Explanation	The representativeness heuristic refers to people's tendency to compare new information or situations to other, similar information or situations. ⁵² When people are presented with a new situation, they tend to ask themselves how similar it is to their image or stereotype of related kinds of people, objects, or situations. ⁵³ This heuristic can also mean that random variation is misinterpreted as a meaningful pattern, as it is human nature to seek out patterns, such as when people bet on specific "lucky" numbers.
Efficiency Implications	Whenever possible, try to relate energy efficiency decisions to other situations and information that is already familiar to the target audience. Market segmentation can help shed light on the target audience and what may already be familiar and appealing to them.
Related Concepts	Availability Heuristic , Heuristics , Recognition Heuristic

Single Action Bias	
Explanation	The Single Action Bias describes people's tendency to respond to the need to take action by making just one change, even if that single action is only the first step needed. ⁵⁴ Making the initial change reduces the feelings of guilt or worry from not having done anything at all, making further action less likely. ⁵⁵ The Single Action Bias is particularly prevalent in the environmental arena, where many people may feel they have done their part once they purchase CFLs or perform some other singular act. However, the Foot-in-the-Door Technique and Cognitive Dissonance both tell us that people may be more likely to make a big change if they've already made a small change, which is somewhat inconsistent with the idea of the Single Action Bias.
Efficiency Implications	Try to incorporate multiple efficiency steps into the same program, using the first step as the basis for further action. This may help prevent participants from feeling that they've satisfied their obligation to efficiency once they've made one small change.

Program Example	20/20 Energy Challenge (FortisBC)
Related Concepts	Fairness, Inequality and Punishment , Foot-in-the-Door Technique , Cognitive Dissonance , Above Average Effect , Social Norms

2.3 Emphasizing Person-to-Person Interaction

The behavior insights described in this section get at the power of people interacting with other people. The impact of personal interactions is often underestimated in promoting behavior change. Using person-to-person interactions or proxies for them—through techniques such as modeling, social norms, and interpersonal communication—requires more resources and time than many of the alternatives. Yet the unique benefits of using these strategies can outweigh the resource challenges.

Competition	
Also known as	Challenges, Tournaments
Explanation	Competitions that reward the participants who change their behavior the most with a prize have been effective in both reducing energy consumption and encouraging people to lose weight. ^{56,57} In one study, college students living in dormitories reduced their energy use by nearly a third through a combination of feedback and a competition with fellow students living in other dorms. ⁵⁸
Efficiency implications	Creating competitions for reducing energy use—particularly those that group participants into teams—may be effective in reducing load.
Program Examples	iCanConserve (Focus on Energy) Be an ENERGY STAR Rock Contest (Puget Sound Energy) Smart Home Energy Monitoring Pilot (Cape Light Compact)
Related concepts	Interpersonal communication , Social Norms

Fairness, Inequality, and Punishment	
Explanation	People are most willing to do what’s best for society when they think others are doing the same. ⁵⁹ Allowing people to punish others who are not contributing, even if only in the form of disapproval, may increase both groups’ willingness to do their part. ⁶⁰
Efficiency implications	Making people’s efforts at reducing their energy use visible will encourage others to pull their weight, too. ⁶¹
Program example	Smart Home Energy Monitoring Pilot (Cape Light Compact)
Related concepts	Social Norms , Modeling Behavior , Single Action Bias , Reciprocity Rule

Interpersonal Communication	
Also known as	Personal Contact
Explanation	Interpersonal communication refers to the power of person-to-person interaction in changing people's behavior. Simply put, people are more likely to change their behavior when someone else is asking them to do so, particularly if the person making the request is someone they know and trust. ^{62,63}
Efficiency implications	This insight explains the success of many community wide social marketing efforts that rely primarily on engaging community members and direct interactions among people. Efforts that involve entire communities and use individual efficiency advocates within those communities may be particularly successful.
Program Examples	iCanConserve (Focus on Energy) Continuous Energy Improvement (Efficiency Vermont)
Related concepts	Social Norms

Messenger	
Also known as	Credible Source
Explanation	In order to encourage behavior change, the messenger of the desired behavior needs to be someone the audience identifies with or wants to be like. ^{64,65} For instance, TV ads often portray characters facing the same everyday challenges we all are—getting dinner on the table, dealing with laundry, and so on—knowing that many people are able to relate.
Efficiency implications	The most effective energy efficiency messengers may not be those portrayed as the "greenest" but rather people struggling to become more energy conscious just like the target audience may be. Alternatively, celebrity endorsements may encourage individuals to partake in more efficient behaviors if the target audience aspires to a similar lifestyle to that of the messenger.
Program Examples	Smart Home Energy Monitoring Pilot (Cape Light Compact) Continuous Energy Improvement Pilot (Efficiency Vermont) Rock the Bulb (Puget Sound Energy)
Related concepts	Social Norms, Modeling Behavior

Modeling Behavior	
Explanation	The concept of modeling means that people need to see what others are doing, that is, make the social norm visible, in order to be able to follow suit. Demonstrating a desired behavior can have a strong impact on the behavior of

	others. ⁶⁶ Curbside recycling programs are thought to have enjoyed such success because the desired behavior, recycling, is visible. By the same token, it is important to avoid showing problem behaviors, as this suggests that the problem behaviors are commonly practiced, which only reinforces the behavior in others. ⁶⁷
Efficiency implications	Making people’s energy efficiency decisions as visible as possible by providing items such as bumper stickers or buttons that advertise a household as energy efficient may reduce others’ energy use.
Program Example(s)	Continuous Energy Improvement Pilot (Efficiency Vermont) Smart Home Energy Monitoring Pilot (Cape Light Compact)
Related concepts	Social Norms, Messenger

Reciprocal Concessions	
Explanation	It is in our nature to cooperate with others, and the concept of Reciprocal Concessions is based on the fact that people tend to honor requests for assistance. ^{68,69} Negotiation strategies work because people are much more likely to accept a second request once they have rejected the first offer. In comparison to the first request, the second request appears to be more reasonable. ^{70,71}
Efficiency implications	If a customer declines participation in a particular energy efficiency program, the utility might consider making a counteroffer of a second program that requires less commitment or effort on the part of the participant.
Related concepts	Reciprocity Rule, Anchor Bias

Social Norms	
Also known as	Social References, Other-Regarding Preferences
Explanation	Social norms describe commonly accepted ways of behaving, and human beings are taught to follow society’s codes of behavior. While people rarely admit to being influenced by others, research has consistently shown that people tend to bring their behavior closer to the norm when they learn what the norm is. ^{72,73} People’s beliefs about both what they think everyone else is doing—as well as what behaviors they think others approve of—powerfully influence their decisions and actions. Recent research has also demonstrated that social norms are more effective when there is a greater degree of perceived similarity between the target audience and the people demonstrating the desired behavior. For instance, people reuse hotel towels more often when presented with information on the high frequency of towel reuse among guests staying in the same room, as compared to information on the frequency of towel reuse in

	the hotel more generally. ⁷⁴
Efficiency implications	Focusing efficiency messages on the desired behavior and suggesting that the majority of one’s peers or one’s role models are already practicing the behavior may help change behavior.
Program Examples	Manage-Act-Save (San Diego Gas & Electric) Smart Thermostat Pilot (Pacific Gas & Electric) Continuous Energy Improvement (Efficiency Vermont) Smart Energy Rewards (Baltimore Gas and Electric)
Related concepts	Modeling Behavior, Messenger, Anchor Bias

2.4 Rewarding Behavior Change

It’s true that people often respond to rewards, but not always in the ways one might expect. This section describes a number of the ways that providing a reward for a behavior change—either before or after the target behavior—can help ensure action actually takes place. The insights outlined in this section additionally illustrate the power of nonmonetary rewards and also the surprising way that providing certain rewards for behaviors people already want to do can actually thwart their intended behavior change.

Crowding Out	
Explanation	Crowding out refers to the fact that offering people a small amount of money to perform a behavior they were already motivated to do may actually <i>reduce</i> the behavior. ⁷⁵
Efficiency implications	Several insights listed in the Rewarding Behavior Change section of this document describe the potential benefits of rewarding behavior change, which seems to contradict the concept of Crowding Out. That said, research also suggests that In-kind Gifts may be more effective than financial rewards. Thus, rather than rewarding efficient behavior with financial rewards or incentives, it may be best to offer a nonmonetary reward or no reward at all.
Related concepts	Cognitive Dissonance, In-Kind Gifts, Reciprocity Rule

Endowment Effect	
Explanation	The Endowment Effect causes people to place a higher value on what they already have as opposed to what they don’t. ⁷⁶ As a result, it appears to be more effective to give people an incentive for setting an energy-saving goal and then take away the incentive if they don’t meet their goal, as opposed to promising to reward them after the fact. ⁷⁷
Efficiency implications	Given people’s favoritism towards what they already have, it may be difficult to convince people to give up older,

	inefficient appliances or equipment, so a larger incentive may be required. It may also be more effective to reward reduced energy consumption beforehand rather than to promise a reward once the goal is achieved. ⁷⁸
Related concepts	Reciprocity Rule , Sunk Costs , Loss Aversion , Discounting-the-Future

Gamification	
Explanation	Gamification incorporates game-like strategies and designs into real world situations. ⁷⁹ Giving a program intervention game-like qualities, such as reward and punishment, and clearly defined rules and strategies can make program participation more fun and can encourage ongoing participation.
Efficiency implications	Gamified energy efficiency solutions provide people with an orderly structure with recognizable rules and objectives. ⁸⁰ This can make reducing energy use seem more achievable and enjoyable to people, increasing Self-Efficacy and the likelihood that people will exhibit the desired behaviors. Using gamification can make programs more fun and appealing to potential and current participants. Additionally, rewarding participants, with energy efficient products, for instance, for behavior change can further motivate them to make future changes.
Program examples	Smart Home Energy Monitoring (Cape Light Compact) Manage-Act-Save (San Diego Gas & Electric)
Related concepts	Competition , Self-Efficacy , Goal Setting

In-kind Gifts	
Explanation	Rewarding people with in-kind gifts appears to be more effective in changing behavior than rewarding them with money. ⁸¹
Efficiency implications	It may be more effective to give people “thank you” gifts such as free CFLs, wraps for their water heaters, etc., than financial incentives or rewards for their reduced energy use.
Program example	Manage-Act-Save (San Diego Gas & Electric)
Related concepts	Reciprocity Rule , Interpersonal Communication , Crowding Out

Lotteries	
Also known as	Certainty Effect
Explanation	The use of lotteries in energy efficiency promotion programs can be useful because people tend to overestimate their

	chances of winning a lottery or raffle. ^{82,83} This means that people may be motivated to change their behavior even if they are only repaid with a <i>chance</i> to win something.
Efficiency implications	People may be more likely to perform a more efficient behavior if doing so will give them a chance to win something big, as opposed to a guarantee of something small such as a traditional rebate. It may be more cost-effective to offer program participants a chance to win one large prize, as opposed to paying for many small incentives or gifts for all participants.
Related concepts	Above Average Effect

Reciprocity Rule	
Also known as	Gift Exchange
Explanation	The Reciprocity Rule explains people’s strong tendency to return favors or gifts with something of equal or greater value, regardless of whether or not they had asked for the initial favor or gift. People tend to think of favors or gifts as debts that must be repaid. ⁸⁴ One example of the reciprocity rule is the grocery store free sample; these small gifts increase the chances that customers purchase the products they sample, as well as other products from that store, in the future. ⁸⁵
Efficiency implications	One example of the application of reciprocity in energy efficiency might be a utility giving away free CFLs, a gift that may make customers more likely to “return the favor,” which could mean fulfilling other requests from the utility such as conserving energy in other ways. Tendencies to reciprocate may be even stronger if people have a connection with the person or entity that is providing them with a favor or gift.
Program examples	IHD Checkout Pilot (SMUD) Smart Pricing Options (SMUD) Save Power Day (Southern California Edison)
Related concepts	Social Norms

2.5 Achieving Follow Through

Even if a person fully intends to make a behavior change, they most often will not unless reminded to do so. This is where achieving follow through plays a key role—goal setting, public commitment and prompts can all serve as the one final push that moves an individual to ultimately take action. This section outlines a number of ways in which people can be effectively motivated to follow through on their intended behavior changes, and what these approaches look like in practice.

External Barriers	
Also known as	Constraints on Choice
Explanation	The concept of external barriers refers to the fact that, regardless of people’s plans to change their behavior, they may not be able to due to factors outside of their control. ⁸⁶
Efficiency implications	An individual cannot be expected to install a more efficient appliance in his home if there is no store he can access that carries it or he cannot afford the new, more efficient model.
Program Example	IHD Checkout Pilot (SMUD)

Goal Setting	
Explanation	Goal setting, or having individuals or households set specific goals for reducing their energy consumption, is effective in achieving the set goals. ⁸⁷ In one study, the effects lasted for at least five months after the program ended. ⁸⁸ Goal setting is particularly effective when combined with a public commitment to that goal.
Efficiency implications	Experiments have shown that asking utility customers to set energy savings goals can result in as much as 10 percent energy savings. ^{89,90} Adding goal-setting to existing programs may increase savings.
Program Examples	Smart Home Energy Monitoring Pilot (Cape Light Compact) DTE Insight Smartphone App (DTE Energy) Continuous Energy Improvement Pilot (Efficiency Vermont)
Related concepts	Public Commitment

Priming	
Also known as	Implementation Intention
Explanation	Due to priming, simply asking people about their plans to perform a given behavior makes it more likely that they will perform the behavior. ⁹¹ This effect becomes even stronger when you ask people more specifically about what they intend to do and when and how they will do it. ^{92,93} Priming has been effectively used in voter turnout campaigns. ⁹⁴
Efficiency implications	Once customers have indicated an interest in reducing their energy use, it may be helpful to ask them when and how they plan to do so.
Related concepts	Prompts

Prompts	
Explanation	A prompt is essentially a reminder to make a behavior change and can take the form of a sign, verbal reminder, etc.

	People are more likely to follow through on changing their behavior if they are given a prompt to do so. ^{95,96}
Efficiency implications	As with any other behavior change, people who intend to conserve energy may still need reminders. An example of a prompt might be a billboard sign that reminds customers to turn the lights off when they leave a room or an email that reminds customers when to change their furnace filter.
Program Examples	Smart Energy Rewards (Baltimore Gas & Electric) DTE Insight Smartphone App (DTE Energy) Smart Energy Manager (Baltimore Gas and Electric) In-Home Display Checkout Pilot (SMUD) Smart Thermostat Pilot (Pacific Gas and Electric)
Related concepts	Priming

Public Commitment	
Explanation	Making a public commitment appears to increase the likelihood that the individual will follow through on a pledge to take some action. Commitments are most powerful when used in combination with other approaches such as feedback. Several experiments show that committing publicly to a particular behavior increases follow through. ^{97,98} In one study, people who had signed a public commitment to conserve energy showed a lower rate of increase in both gas and electricity consumption than those in either the private commitment or the control group. ⁹⁹ This effect was maintained for at least six months following the end of the intervention.
Efficiency implications	For customers who already intend to make an energy efficiency change, it may be beneficial to encourage them to commit publicly to doing so.
Program Examples	Continuous Energy Improvement Pilot (Efficiency Vermont) 20/20 Challenge (Fortis BC)
Related concepts	Interpersonal Communication, Social Norms, Goal Setting

3 Behavior Insights and Connected: Most Applied and Applicable

Pilots and programs have incorporated a whole host of behavioral insights in combination with connected technologies. A number of behavior insights may be especially conducive to leveraging together with connected technologies. In some cases, a particular behavior insight has already been incorporated into many connected pilots.

In others, the potential intersection of certain behavior insights with existing or potential device capabilities is ripe for achieving new energy savings.

3.1 Feedback

Feedback may be the most obvious behavior insight to combine with these new technologies. Feedback includes providing information on customers' energy use or related costs, and that's precisely the capability of connected technologies, which provide new opportunities to provide targeted, personal information to individuals at a time when they are able to act on this information. Yet there is additional social science knowledge that could help make the most of the energy-saving potential of this insight. For instance, feedback is more effective the more frequently and the closer in time it is provided to the target behavior.¹⁰⁰ Pacific Gas and Electric's [Home Area Network](#) pilot took advantage of this insight by providing energy use and cost data to consumers in real time.

3.2 Social Norms

Pilots incorporating connected technologies have begun to leverage social norms. So far, social norms have played a role primarily in web portals where customers can view how their energy use compares to that of similar neighbors over time.

Yet there are still significant opportunities to leverage social norms in new and innovative ways, perhaps in ways that would increase associated energy savings. For example, as described earlier, research has long demonstrated that feedback is most effective at changing target behaviors the sooner after the behavior it is provided.¹⁰¹ Although to our knowledge research has not yet addressed this question, social norm information might also carry more weight if it were provided in a timelier manner—something these technologies could facilitate. For instance, an [In Home Display](#) (IHD) that provides not just your own, real time energy use, but also a real time comparison of how you measure up to similar neighbors could be particularly powerful. Imagine a screen telling you that at this very moment you are using more energy than 93 out of 100 similar customers. Such timely information could also provide more immediate gratification when prompt behavior changes are seen to quickly improve one's relative ranking.

These technologies also have the capacity to more effectively take advantage of the research that demonstrates that the higher the level of similarity between a person and their peer comparison group is, the greater the influence the social norms will have on changing their behavior. Take, for instance, the research on towel reuse at hotels, and the significantly greater number of hotel guests who opt to reuse their towels when they are informed of the high percentage of previous guests staying in their same room who have made that decision, relative to other guests who were informed only of the hotel-wide reuse rates.¹⁰² Despite this knowledge, peer comparisons in energy efficiency still tend to be somewhat generic, which is something that these technologies might help change. The ability to pool and aggregate and anonymize the kind of household and building characteristics used

to generate comparisons for home energy comparison programs for the purposes of more targeted real time data could present a unique opportunity to compare customers to more similar households, and to leverage the closer comparison group to more effectively encourage behavior change.

3.3 Prompts

Prompts are a straightforward behavior insight—the idea is that people need to be reminded to change their behavior, even if they intend to do so—and connected technologies can make generating prompts even easier. For instance, a number of the pilots described in this document, such as [Home Area Network](#) (PG&E), [IHD Checkout Pilot](#) (SMUD), and [SmartPricing Options](#) (SMUD), use In Home Displays as a device. On the most basic level, the IHDs serve as a nearly constant reminder to be aware of energy use simply by virtue of their continual presence, ideally in a high traffic area of the home. Above and beyond the IHDs simple presence, the actual information displayed—about energy use, related costs, or both—can serve as an additional reminder. For customers using the DTE [Insight Smartphone App](#) (DTE Energy) were given frequent prompts, including tips on how they could reduce their energy use.

Pilots that include an app for smartphones or tablets have the added benefit of prompting people to change their energy use behaviors through a device that they are often using anyways, and is even more frequently nearby.

3.4 Loss Aversion and Discounting the Future

Given that people tend to try to avoid losses of things they already have more than they try to gain new things, the ability of connected devices to illustrate the money lost by excessive energy use could be invaluable. IHD programs such as [SMUD's](#) and [PG&E's](#) already include information about energy costs and, in some cases, the cumulative cost of that energy use. Going a step further and framing as a loss this already available information could make it all the more powerful. For instance, in addition to simply showing customers how much they've spent on energy in a certain timeframe, high use households could also be shown the amount of money they're unnecessarily losing, based on what they're spending over and above the typical energy use level for a similar household. While this messaging could likely be conveyed via other media, the addition of connected devices could make the messages particularly timely and impactful. [Discounting the future](#)—that people tend to value current gains or losses over those off in the future—is closely related. Some connected programs such as [SMUD's](#) have already taken advantage of this by including *cumulative* energy cost information, rather than just current. Others, such as [PG&E's](#), project out how much customers will be paying at the end of the month if they continue along the same consumption trajectory. The ability to project these numbers out into the future and display them in advance may help make these future costs a bit more tangible, thereby mitigating the tendency to discount the future.

3.5 Above Average Effect and Cognitive Dissonance

A secondary power of social norms is that a glimpse at others' energy use can reveal that your relative standing isn't quite as impressive as expected. As the [Above Average Effect](#) describes, people tend to have an inflated sense of how their abilities and habits compare to those of the general population. The real time data provided by connected devices can help dispel this notion effectively in part because the much greater number of data points makes for a compelling visual case of relative efficiency. It's more difficult to maintain the illusion of superiority when that line graph on your web portal illustrates that your energy use is higher than similar households' day after day. This knowledge in turn can activate [Cognitive Dissonance](#)—the mental conflict that arises when your actions fail to align with your self-perception or your own image of yourself—and when presented with information that you're not very energy efficient but you always saw yourself as a saver, you may be more likely to try to change your behaviors to be closer in line with your preferred perception of yourself. San Diego Gas & Electric [Manage-Act-Save](#) pilot uses this insight by providing information to customers on how energy efficient both they and other participants are in frequent insight reports.

3.6 Self-Efficacy

The motivation to change one's behavior when presented with the plethora of information afforded by connected technologies is at least in part determined by the individual's [Self-Efficacy](#) or, in other words, the degree to which changes in behavior are believed to lead to the desired outcome of using less energy or saving on energy costs. Again, connected technologies have huge potential to help make this possible. Real time energy use information is one of the sharpest tools in the toolbox of self- efficacy, because behavior changes such as turning off an unnecessary AC are visible nearly right away and sufficiently significant that they help reinforce the self-efficacy needed to continue to make such changes. San Diego Gas & Electric [Manage-Act-Save](#) pilot increases participants' self-efficacy by providing energy saving tips that are personalized to help increase participants' confidence that recommended actions will result in energy savings for their particular household.

3.7 Competition

[Competition](#) presents a great deal of opportunity when leveraged together with connected technologies. Existing connected pilots and programs have taken a variety of different approaches to incorporating competition—for instance by having communities compete with each other in the case of [iCanConserve](#)—and significant additional opportunities may remain. Perhaps the real time informational aspects of two-way technologies could someday allow customers to anonymously compete with each other in near real time. Competitions could be enhanced by including social norm information as well, further motivating change. For instance, there could be competition prizes associated with one's relative energy saving percentile, with the ability to see how their household ranked relative to

other anonymous) ones. The possibilities are vast when it comes to using real time data capabilities to inspire customers' competitive spirit and motivate energy saving behavior changes.

3.8 Goal Setting

Having customers set achievable goals for themselves using connected technologies is a great way to increase energy-conscious behaviors since the technology provides an easy and reliable way of measuring energy use. One of the components of the DTE [Insight Smartphone App](#) is goal setting. Since it retains data on energy use over time, it can provide customers with information regarding their consumption habits over periods with particular weather patterns and can urge customers to use less energy (or at least no more) than they typically used during periods with similar temperatures. This holds people accountable for how much gas and electricity they are using, and gives them an idea of how much is realistically necessary for them to be using at different times throughout the year.

Goal setting can be even more effective when combined with other behavioral insights. For instance, pairing goal setting with public commitment makes the desired energy-conscious behaviors more visible, increasing the likelihood that others will follow suit. By using connected technologies, customers are able to see that others are committing to and reaching their goals, which can further motivate them to reach their own goals.

3.9 Public Commitment

Public commitment—when someone pledges to others their intent to take action, which significantly increases the likelihood of following through as a result of that pledge—has not been leveraged much to date in connected programs though it has been successful in many other types of programs. For instance, in the [FortisBC 20/20 Challenge](#), participants were asked to specify how they planned to reduce their energy consumption when they brought in old bulbs to exchange for CFLs in an attempt to avoid the [Single Action Bias](#). This persuaded customers to increase their commitment to saving energy rather than letting them off the hook for completing one small action.

The technical capabilities of connected devices might lend themselves well to better taking advantage of the persuasive potential for public commitment. Since connected devices allow for inter-household comparisons, displaying the specific anonymous commitments of neighbors to save energy to other connected technology users could make these devices even more impactful. Public commitment data could compel IHD owners or app users to adhere to social norms and set similar goals. This has the potential to be highly effective because of the level of accountability. Households commit to savings they think are achievable, and other connected users are able to see if they are meeting their goals.

Additionally, the behavior insight [Fairness, Equality and Punishment](#) is relevant

here because the motivation to succeed comes from the knowledge that others are reaching their goals and may disapprove if you fail to reach your own.

4 Program Examples

This section includes more detail on each of the programs that were listed as examples in the Behavior Insights and Tools section of this document. Wherever possible, we included a connected pilot or program example for each insight; however, because this is a new area, there are several insights that only non-technology based programs have incorporated, at least to our knowledge.

Program examples were identified through the [CEE Behavior Program Summary](#), Behavior, Energy & Climate Change (BECC) Conference Proceedings, as well as reaching out to members suspected to have relevant pilots and programs. (If you do not already have access to the CEE Forum, please contact Casey Erisman at cerisman@cee1.org for a username and password.) The program examples provided here are not intended to be comprehensive; there are likely other CEE member pilots and programs that both include connected technologies and apply these insights.

4.1 Home and Business Area Network (HAN) *Connected* Pacific Gas and Electric

Program Information	
How Behavior Insights were incorporated	<p>Confirmation Bias: This pilot focused on reaching the most highly engaged sector of PG&E customers; these were customers who were likely already big believers in the efficacy of EE programs, and were likely to see their participation in this pilot as another affirmation of the value of EE programs</p> <p>Discounting the Future: It's easier to discount energy costs when notifications about them are only received on a far away monthly bill; this more frequent energy cost information makes it easier for a future cost to get people's attention in the present.</p> <p>Feedback: IHD provides energy use and costs in real time, taking advantage of the fact that feedback is more effective the sooner after the behavior it's provided.</p> <p>Loss Aversion: The device illustrates how much money participants are spending/losing all the time.</p>
Pilot or program	Pilot Phase 3
Dates implemented	August-December 2014
Technology, Vendor	Bigdely gateway and Aztech In Home Display (IHD)
Interface	<p>Bigdely: Data available through the customer's phone, tablet, or computer via an app or web portal</p> <p>Aztech: Data available directly through in home display technology</p>
Goals	Help customers monitor their energy use and costs in real time, better understand the monthly cost of their electric consumption, reduce their peak demand or conserve electricity use
Strategy, Approach	Develop and deploy PG&E HAN infrastructure to provide timely delivery of pricing and demand response messages while also better understanding customer perception and use of the devices, the potential incremental effect of HAN devices on demand response load impacts and energy consumption.
Sectors	Residential, small and medium business (SMB)
Geographic location	California
Target audience	SmartRate and TOU residential and business customers
Participating audience	1,685 customers: 1,001 from SmartRate target base, 584 from TOU target base
Funding source	Ratepayer
Full description	The HAN Phase 3 pilot tested two types of HAN technology and built upon the infrastructure created in phase 1 and 2 of the project. Phase 3 updated the HAN platform by creating and communicating load control signals (ex. price signals, demand response event alerts) to participating households with the aim to help customers more

	effectively manage their response to time-varying electric rates. As such, the pilot targeted time of use (TOU) and SmartRate customers. The HAN devices were shipped to participants, who were expected to register and join their devices on their own using instructions included in the device shipment.
Evaluation Information	
Evaluation design	<p>Quasi-experimental: matched control via propensity score, randomization not possible</p> <p>Impact evaluation using difference-in-differences technique</p> <p>Fixed-effects regression model to determine additional benefits</p> <p>Used data collected from the SmartMeter™, participant surveys, and focus groups</p>
Evaluation metrics, success criteria	Energy savings and customer satisfaction
Evaluation results	<p>Only one participant group, one of the TOU groups, experienced statistically significant overall energy savings—7.7% savings</p> <p>Average of 3% load reduction across all event days—not statistically significant at the 90% confidence level</p> <p>Self-report data indicated the pilot resulted in some statistically significant changes in household energy use behavior including installing power strips to reduce vampire load, washing dishes and laundry in cold water, and turning off lights when not in use.</p>
Customer experience	Customers reported higher levels of initial satisfaction with the Bidgely gateway as compared to the Aztech IHD. However, these reports were contrasted by participant reports of using the Aztech IHD more frequently. As such, Aztech users reported far more energy reducing actions.
Lessons learned	<p>Participants indicated a preference for additional customer support from PG&E and survey results indicated customers would benefit from greater education regarding the data provided by the HAN.</p> <p>Future pilots would benefit from larger participant groups to further investigate promising peak savings suggested by this pilot and detect smaller differences between treatment and control groups.</p> <p>Participants' reported level of satisfaction may not be indicative of level of use or potential energy savings—whereas participants reported higher levels of satisfaction with the Bidgely, they reported greater use of the Aztech.</p> <p>A caveat to these results is that this pilot included PG&E's most highly engaged customer sector, and may not be indicative of the energy savings that would be achieved by a wider swath of customers.</p>

4.2 Manage-Act-Save *Connected*

San Diego Gas & Electric

Program Information	
How Behavior Insights were incorporated	<p>Above Average Effect/Illusory Superiority: Providing information about how energy efficient other participants really are helps to combat participants' natural tendency to assume they're more efficient relative to others than they really are.</p> <p>In-kind Gifts and Gamification: Customers can earn prizes such as gift cards for coffee, Amazon, etc.</p> <p>Social Norms: Customers can compare their energy use to that of other participants in the program.</p> <p>Self-Efficacy: Personalized energy saving tips facilitate making the case that taking the recommended actions will actually result in energy savings.</p> <p>Status Quo Bias/Default Bias: auto-enrollment in program</p>
Pilot or program	Pilot and Program
Dates implemented	July 2013–December 2015
Technology used	Smart Meter Data
Interface	ESPI Data Standard is used to transfer customer AMI data
Goals	2-3% kWh savings, 50K activated customers, 20% complimentary program uptake
Strategy, Approach	<p>Continue to enable access to electricity consumption data by residential customers and their authorized third parties.</p> <p>Further empower residential customer to better manage their electricity use.</p> <p>Provide or support the use of third-party tools and software products that use the available data to deliver added value to the residential customer.</p>
Sector	Residential
Geographic location	San Diego Gas and Electric service territory
Target audience	Residential customers with an active smart meter
Participating audience	Residential customers with an active smart meter
Number of participants	Initial launch (group A) ~200K residential tier 3 & 4 customers; group B ~200K residential customers
Funding source	DOE, Ratepayer
Program funding type	DOE Grant and Energy Efficiency
Total budget	DOE Phase II grant was \$2M and SDG&E provided matching funds
Full description	Customers that are auto-enrolled in the project will receive insight reports showing their energy use through either direct mail (bimonthly

	<p>paper reports), or email (weekly reports). Both communication channels encourage customers to go to the website www.sdgeactsave.com where customers can then view their energy use in more detail.</p> <p>Customer Benefits</p> <ul style="list-style-type: none"> • Increases consumer access and awareness of their energy use • Earn rewards that appeal to the customer • Personalized tools, messaging, and recommendations to encourage program signups
Evaluation Information	
Evaluation design	Experimental design (Quasi-experimental design and RCT)
Evaluation metrics, success criteria	Energy Savings, Customer Satisfaction, Increased awareness of other energy efficiency programs
Customer experience	<p>Energy Insights: Customers can graphically view their energy use data over time as well as targeted energy-saving tips and SDG&E programs</p> <p>Energy Community: Customers can compare their performance in the program against others.</p> <p>Energy Rewards: Customers can redeem the points they earn for rewards offered through the Manage-Act-Save site. These rewards include a variety of e-gift cards, and charitable donations.</p> <p>Multi-platform Communication: Customers are regularly engaged through the web, mobile devices, email, and paper reports if no email is available</p>
Lessons learned	Auto-enrolling customers works best; subject line testing has shown that there is an increase in customer response for loss aversion.
Current status and next steps	Completed in 2015
Links to Additional Information	
Program website	sdgeactsave.com (no longer active)

4.3 iCanConserve *Connected*

Focus on Energy and Wisconsin Public Service

Program Information	
How Behavior Insights were incorporated	<p>Competition: Communities were competing against each other for a community reward.</p> <p>Discounting the Future: Focus on Energy effectively generated repeated surges in demand for participation in the pilot by releasing time-limited offers that helped overcome this bias.</p> <p>Interpersonal Communication: Person-to-person interactions fostered through on the ground, community approach and during the in-home audit; positive feedback was received from participants specific to the in-person interactions that took place throughout the pilot.</p> <p>Status Quo Bias The pilot participants in Plover were automatically set up to receive time of use (TOU) rates—while they had the opportunity to opt-out if they preferred, this approach helped avoid the status quo bias that plagues opt-in programs, where people are far more likely to stick with the default option rather than opt into a program. As a result, 57 percent of the Plover customers who were automatically set up on TOU rates did not opt-out of these rates, while a mere 3 percent of customers across the other two communities, most of whom were asked to opt-<i>in</i>, chose to participate.¹⁰³</p>
Pilot or program	Pilot
Dates implemented	October 2010-2013
Technology, vendor	<p>Participants had the opportunity to use a variety of different technologies throughout the pilots offered by different vendors via the Tools and Technology option. These technologies included:</p> <ul style="list-style-type: none"> Smart thermostats (residential and commercial sectors) In-home displays (residential) Home energy management systems (residential) Watt Meter Google Power Meter (Discontinued in 2011) = DLC Technology
Goals	<p>Achieve cost-effective energy use reductions.</p> <p>Better understand customer information needs related to energy use and their pricing option preferences.</p> <p>Test the effectiveness of community approaches designed to alter behavior using social networks and social marketing to increase participation.</p> <p>Determine the potential savings from the integration of rate designs, community approaches, and efficiency programs in conjunction with feedback mechanisms.</p>
Strategy, approach	In order to achieve the goals listed above, the pilot included four main

	<p>components:</p> <ol style="list-style-type: none"> 1. Energy Efficiency program opportunities (such as audits) 2. Promotion of nonstandard rates, some specific to iCanConserve only 3. Tools and technology options 4. A community reward for each community that reached specific participation targets
Sectors	Residential and Commercial
Geographic location	Brillion, Plover, and Allouez communities in Wisconsin
Target audience	Residential and Commercial Customers
Participating audience	Residential and Commercial Customers
Full description	<p>The iCanConserve pilot aimed to "determine the customer acceptance, cost-effectiveness, and the transferability of large scale pilot offerings that include new electric rate designs, customer education, information and tools, and energy efficiency initiatives that seek to provide 'deeper and broader' cost-effective energy savings per customer and per program." (KEMA, 2013). Each community received slightly different pilot delivery, with offerings from the four components varying among the communities. In particular, the pilot start dates were staggered to allow for pilot efforts to build on knowledge and experience generated in one community and apply it to another.</p>
Evaluation Information	
Evaluation design	<p>Quasi-experimental (comparison groups for all three communities, no random assignment)</p> <p>Data were collected from billing data, in-depth interviews, focus groups, and surveys.</p>
Evaluation metrics, success criteria	<p>There were several evaluation metrics for this pilot:</p> <ul style="list-style-type: none"> • Savings associated with rate options and savings per capita for participation in rate options and other pilot offers • Pilot impact on attitudes and behavior towards energy efficiency • Key successes and lessons learned for expansion to statewide programs and development of future pilots
Evaluation results	<ol style="list-style-type: none"> 1. About three percent savings in each of the communities. 2. Interactive effect between time of use rates and the Tools and Technology aspect leading to nine percent savings for customers participating in both parts of the program. For contrast, customers just participating in time of use pricing only reduced energy use two percent and customers only using Tools and Technology reduced their energy use by four percent. 3. Survey results and interviews revealed that customer knowledge changed more than attitudes during the course of the program. These data sources also indicated that the program impact was stronger among residential participants than commercial ones.

	<p>4. Interviews revealed that the pilot was successful at meeting the goal of raising customers' awareness of the pilots and their related energy options.</p> <p>5. Automatically enrolling customers in a default electricity rate resulted in higher levels of participation than opt-in structures. 57 percent of Plover community residents automatically switched to a pilot rate remained on that rate whereas only about three percent of residents across all three communities opted into an alternative rate.</p>
Customer experience	Throughout the evaluation process, customers consistently remembered personal communication regarding the pilot or reported high levels of satisfaction with one-on-one communication. This points to the success of personalized marketing and customer contact during the pilot.
Lessons learned	<p>The speed of pilot rollout made it almost impossible to meaningfully apply lessons learned in one community to the next location. More gradual program rollout might help transfer key takeaways from one community to another.</p> <p>Customers frequently indicated that saving money was a key motivating factor in participating. In the future, pilot messaging could focus more heavily on messaging regarding this benefit of the program.</p> <p>Importance of aligning intended behaviors with the technical capabilities of the technology. For example, many customers received notification of peak events but could not take any action because they were away from home without the ability to control energy-using devices remotely. Perhaps creating a closer link between time of use notifications and mobile connected technologies could further enhance savings.</p>
Savings claimed	N/A

4.4 Smart Energy Rewards[®] *Connected* Baltimore Gas & Electric Company

Program Information	
How Behavior Insights were incorporated	<p>Prompts: Event notifications are sent when energy-saving behavior is desired.</p> <p>Social Norms: Post-event communications compare each customer's rebates to their prior event savings. For some customers, the territory average is shared to encourage them to reach or exceed average performance in subsequent events.</p> <p>Status Quo Bias, Default Bias: Signups are not required to participate, so there are no additional steps to be part of the program.</p>
Pilot or program	Program
Dates implemented	2013-Current
Technology, vendor	Opower
Goals	Pre-event communications (phone, email, text), post event communications (phone, email, text, web presentment of savings, and printed savings reports)
Strategy, approach	<p>Motivate customers to reduce load on peak electric demand days (Energy Savings Days); specifically target customers that do not participate in a traditional demand response program; reward customers with a bill credit for their participation in reducing their electric consumption on peak days; increase customer satisfaction; support smart grid business case</p> <p>Incentive program that encourages and rewards customers to reduce their electric consumption on peak electric demand days with no penalty for nonparticipation. All residential customers with a smart meter are eligible to participate. No sign up is required.</p>
Sectors	Residential
Geographic location	Maryland
Target audience	Any customer that is on a residential electric rate with a smart meter. That is just over 1M customers.
Participating audience	All enrolled customers are notified before an Energy Savings Day. Of those customers, an average of 80% participated in the Energy Savings Day by reducing their electric consumption. Participation is defined as a customer who reduces their electric consumption below their average consumption on similar weather days.
Number of participants	Over 1M participants in 2015.
Full description	BGE Smart Energy Rewards is a voluntary program that helps BGE residential customers earn peak time rebates on summer electricity bills. The program is currently available to BGE residential customers with smart meters. The BGE Smart Energy Rewards program is designed to encourage customers to use less electricity during summer peak hours. Managing summer peak demand helps to reduce

	the need for additional power generation plants, keep down the overall cost of electricity, and ease the burden on Maryland's electricity delivery system as the state's electricity demands continue to grow.
Goals	
Evaluation design	Nonexperimental design
Evaluation metrics, success criteria	Customer participation (percentage of customers that reduced their energy use on Energy Savings Days) Customer satisfaction Awareness of program(s) and energy efficiency in general
Evaluation results	An average of 80% of eligible customers participated during Energy Savings Days. This is defined as customers that earned a bill credit for reducing their electric consumption on an Energy Savings Day.
Customer experience	At the end of the third season, with over 1M eligible customers, customer satisfaction with the program was high and customer recall of program communications was high.
Lessons learned	Improving customer contact information is critical to the success of the program. Prior to the launch of BGE Smart Energy Rewards program, BGE launched a campaign focused on improving data integrity. System integrations between BGE and its suppliers are necessary to minimize data issues.
Savings claimed	BGE has paid over \$28M in bill credits for program years 2013-2015.
Current status and next steps	Continue to enroll customers into the program, as smart rollout is finalized. Continue to find new ways to engage customers through marketing efforts and program awareness.
Links to Additional Information	
Program website	bge.com/smartenergyrewards

4.5 Smart Energy Manager[®] *Connected* Baltimore Gas & Electric Company

Program Information	
How Behavior Insights were incorporated	<p>Discounting the Future: Customers receive messages warning them of high use when they are using more electricity than usual.</p> <p>Feedback: Smart meter enables the utility to share hourly use information to customers.</p> <p>Prompts: Customers receive tips on how they can save more.</p> <p>Recognition Heuristic: By alerting customers to higher-than-usual energy use, customers may choose to lower consumption to align their behavior with how they acted in the past. High Usage Alerts emphasize the fact that this behavior is not typical for the customer.</p>
Pilot or program	Program
Dates implemented	2012–Current
Technology used	Opower
Interface	AMI data presentment on web Home Energy Reports (paper and email), High Usage Alerts (phone, email, text) and Weekly Energy Usage Reports (email)
Goals	<ul style="list-style-type: none"> - Provide customers with an online tool that helps them get the most out of their new smart meter by providing hourly use information, neighbor comparisons, how weather impacts use among many other features. - Educate customers on conservation programs - Customer savings - Proactively notify customers about high use on their account which may result in a high bill - Increase customer satisfaction - Support our smart grid business case
Strategy, approach	Empower customers by providing gas and electric hourly use data, made available by their smart meters. All residential customers with a smart meter are eligible to participate. No sign up is required.
Sector	Residential
Geographic location	Maryland
Target audience	Anyone on a residential electric or gas rate with a smart meter. That is just over 1M customers
Participating audience	Anyone in the intended target audience who meets the eligibility requirements for the program. Eligibility is determined on the customer and premise.
Number of participants	760,000 customers are in the recipients group. There are ~51,000 customers in the control group.
Funding source	
Program funding type	

Full description	<p>BGE Smart Energy Manager is available to all residential customers with certified smart meters. This program provides personalized tools for managing energy use including Home Energy Reports, online tools, and alerts.</p> <p>Energy Reports are designed to provide information that will help customers understand the way their households use energy and find smart ways to make their homes more efficient. Each report may provide a customer with a neighbor comparison to see how they are doing compared to their neighbors, a personal comparison to see how they are doing compared to a prior period, and savings tips.</p> <p>Online tools are designed to provide customers with more detailed information about their energy use. They can analyze things such as energy consumption hour-by-hour and day-by-day to understand how much energy they're using and when they use it most, compare a home's electric use to other similarly-sized homes in the neighborhood that are not part of the program, receive helpful energy-saving tips and rebates, and build a personalized energy plan.</p> <p>Alerts are designed to provide customers with information about their use without having to log in to the website. Unusual Usage Alerts are sent via text, email or phone when use is trending higher than normal for a household. Customers can react and save before their actual bill arrives. Weekly Usage Reports help track and manage use throughout the month without by providing a week-over-week comparison.</p>
Evaluation Information	
Evaluation design	Experimental Design
Evaluation metrics, success criteria	Gross Impact, Uplift Analysis, and Net Impact, Customer Satisfaction
Evaluation results	Navigant SEM Program Evaluation Report
Customer experience	
Lessons learned	Improving customer contact information is critical to the success of the program. System integrations between BGE and its suppliers are necessary to minimize issues arising from data challenges and to minimize access issues with customers.
Current status and next steps	Manage program at scale and evaluate proposed enhancements.
Links to Additional Information	
Program website	bge.com/SmartEnergyManager
Link to evaluation report	Not yet available

4.6 Nest Thermostat Heat Pump Control Pilot *Connected* Energy Trust of Oregon

Program Information	
How Behavior Insights were incorporated	<p>Discounting the Future: This pilot makes the connection between lower energy use and lower costs.</p> <p>Status Quo Bias/Default Bias: Most participants did not appear to switch their Nest out of the maximum savings mode.</p>
Pilot or program	Pilot
Dates implemented	November 2013–May 2014 or one entire heating season
Technology, vendor	Nest Learning Thermostats, CLEARResult
Interface	Nest Thermostat, smartphone app, web portal, online account
Goals	<ol style="list-style-type: none"> 1) Determine if Nest Thermostats offer a viable strategy for controlling central electric heat pump operation in residential settings 2) Determine how much electricity they save during the heating season 3) Better understand how customers interact with Nest thermostats, their level of satisfaction, and its control of the comfort of a home
Strategy, approach	Direct install of Nest Thermostats into residential homes in efforts to find a cost-effective alternative to existing heat pump advanced control measures and better understand customer use and satisfaction. Participants were recruited from a pool of previous Energy Trust program participants who met a list of specific criteria.
Sector	Residential
Geographic location	Western Oregon
Target audience	Goal: 200 residential homes
Participating audience	Residential homes: 185 thermostat installations, due to technical issues throughout the pilot, 174 homes had the Nest installed for the duration of the study.
Funding source	Energy Trust of Oregon Existing Homes program
Program funding type	Ratepayers
Full description	<p>The Nest Thermostat Heat Pump control pilot aimed to specifically test how two features of the Nest fit ETO’s existing heat pump advanced control measure. Specifically:</p> <ol style="list-style-type: none"> 1. The Nest capability to lock out the electric resistance backup heat source using Internet data, eliminating the need to run an outside wire 2. Its dynamic lock out algorithm that eliminates the need to set a hard lockout temperature <p>The pilot tested these features in residential homes with existing central ducted, electric backup heat pump systems, excluding DHP, ground source, or gas backup systems. 185 residential homes received direct install of the Nest Thermostat in late Q3 of 2013 so energy use</p>

	<p>during the 2013–2014 heating season could be evaluated.</p> <p>During installation, the heat pump balance point setting was set to "Maximum savings" and the homeowner received instruction on how to adjust other thermostat settings. In addition, the managing contractor developed a standard set of instructions to leave behind with the homeowner.</p>
Evaluation Information	
Evaluation design	<p>Quasi-experimental: comparison group, random selection from preestablished participant pool</p> <p>Staff interviews, participant surveys in January and May 2014, and billing analysis provided the main components of the evaluation.</p>
Evaluation metrics, success criteria	Participant use, perceptions, satisfaction, and reactions to Nest . There were changes in these metrics over time.
Evaluation results	<p>1. 781 kWh annual, weather-normalized savings attributable to Nest: 4.7 percent of total electric use and 12 percent of heating load</p> <p>Subgroup analysis further revealed interesting trends. For example,</p> <ul style="list-style-type: none"> • The lowest income category had the largest percent savings of any subgroup analyzed. • Manufactured homes—generally smaller, lower income, and requiring less energy—appeared to have savings nearly double the overall average. <p>2. 93% realization rate for what was estimated for ETO's heat pump advanced control measure.</p> <p>3. The highest use category, i.e. most opportunity for reduction, achieved the largest absolute electric savings: nearly double the overall average and statistically significant</p>
Customer experience	<p>Generally, participants were very satisfied with the pilot and Nest device and satisfaction ratings were overwhelmingly positive. 60% of survey respondents rated their home as either "somewhat more comfortable" or "much more comfortable" after installation of the Nest thermostat.</p> <p>The most cited reason for participation in the pilot was to lower energy bills. Also, the non-energy benefits from the Nest were perceived to be large. Over 34% of respondents believed the Nest was worth the full retail price even if no energy savings were realized.</p> <p>In the second survey, 92% of respondents found operating the Nest Thermostat either "somewhat easy" or "very easy". The Nest Leaf, AutoSchedule, Energy History, and Early On features were the most frequently used by pilot participants.</p>
Lessons learned	<p>Evaluation of the Nest Thermostat heat pump control pilot revealed Nest as a viable technology that received high marks from participants and achieved significant energy savings.</p> <p>While savings are in line with estimates for other advanced heat pump controls, installation and the setup of the Nest is simpler and potentially less expensive.</p> <p>While this pilot tested the Nest under ideal installation conditions,</p>

	<p>direct-install model, results suggest contractors and potentially homeowners could be equally as successful when paired with electronic verification processes and customer support.</p> <p>How people engage with the device impacts the savings, for example, in this pilot about 12% of participants changed settings from "Maximum Savings" after installation. In addition, one in five people turned off the Auto Away feature—this could have been in response to the Nest turning off heat in larger homes where people weren't walking by the sensor often.</p>
Savings claimed	N/A
Current status and next steps	<p>Planning to accelerate the deployment of the Nest and similar advanced thermostats in homes with heat pumps. This will include an incentive for self-installed advanced thermostats for existing heat pump systems, which began in 2015.</p> <p>Second Pilot—Advanced thermostats in gas heated homes. Includes the Nest and Honeywell Lyric thermostats. The Honeywell Lyric uses a different automated setback strategy than Nest. It relies on customers' smartphones to determine their location and sets thermostat accordingly. Initial results expected fall 2015</p>
Links to Additional Information	
Program website	<p>Link to general Existing Homes program info web page: http://energytrust.org/residential/homeowners/</p> <p>Link to current smart thermostat pilot web page: http://energytrust.org/residential/promotions/smart-thermostat-study.aspx</p> <p>Link to Energy Trust heat pump advanced control incentive info web page: http://energytrust.org/residential/incentives/heating-and-cooling/heat-pump-advanced-controls</p>
Link to evaluation report	http://assets.energytrust.org/api/assets/reports/Nest_Pilot_Study_Evaluation_wSR.pdf

4.7 IHD Checkout Pilot *Connected*

Sacramento Municipal Utility District

Program Information	
How Behavior Insights were incorporated	<p>Discounting the Future: The IHD displayed real time electricity use along with an estimate of real time costs, with a goal of creating an association in the customer’s mind between energy consumption and cost.</p> <p>Reciprocity Rule: Participants were given a smart meter to borrow, so they felt an obligation to use the IHD to reduce their energy use.</p>
Pilot or program	Pilot
Dates implemented	2012–2013
Technology, vendor	EnergyAware
Interface	In-home display
Goals	Customer engagement, energy awareness, information feedback, energy and bill savings
Sector	Residential
Geographic location	Sacramento, California
Intended target audience	All residential customers
Participating audience	1,155 IHDs were distributed to residential customers
Funding source	SMUD and DOE ARRA funding
Program funding type	Ratepayer and federal grant
Full description	From the report: “SMUD’s 2012–2013 In-home Display (IHD) Checkout Pilot offered residential customers the opportunity to borrow an IHD from SMUD for a period of two months. The IHD communicated with SMUD’s electricity meter at each site to display the near real time electricity use and cost of the home. The objective of the evaluation was to estimate the load impacts associated with this pilot, with a focus on the impacts on customer bills, energy use, and summer peak demand. The IHD Checkout Pilot involved a single study group comprised of customers who requested, received, and installed an in-home energy display (IHD) that communicated with their smart meter to provide energy use information.”
Evaluation Information (<i>if applicable</i>)	
Evaluation design	Quasi-experimental design. Control group, but no randomization
Evaluation metrics/success criteria	Energy savings, peak savings, bill savings
Evaluation results	Average energy savings of 2.6%, bill savings of 3.4%, and peak savings of 4%
Customer	Customers would go online to My Account, request an IHD for

experience	checkout and wait to receive it in the mail. Once received, they would open the packaging and follow instructions to connect the provisioned device to their meter. If they experienced difficulties, they could contact SMUD customer service representatives for assistance. The display could be used for two months and returned via prepaid envelope back to SMUD.
Lessons learned	It is worth exploring further why customers didn't save energy for the first two months of the pilot. Also, energy savings increased after the two-month IHD return date had passed, suggesting that perhaps customers benefitted more from the energy education and awareness provided by the IHD than its ongoing presence.
Savings claimed	None were claimed for energy efficiency goals, only measured for evaluation purposes.
Current status and next steps	Pilot was extended beyond the research period.
Links to Additional Information	
Link to Evaluation Report	http://www.herterenergy.com/pdfs/Publications/2014_Herter-SMUD.IHD.Checkout.pdf
Images	<p>The image shows a smart meter display with the following components labeled:</p> <ul style="list-style-type: none"> Signal strength: Indicated by a signal strength icon in the top left corner of the screen. Battery life: Indicated by a battery icon in the top right corner of the screen. Current, accumulated electricity use in \$ or kWh: The main display area shows "Current Use" with a large "\$1.2839" and "Per Hour \$0.0900 / kWh" below it. Pricing intervals & upcoming pricing changes or CPP events: Indicated by a small bar with three colored segments (green, orange, red) at the bottom of the screen.

4.8 SmartPricing Options *Connected* (Consumer Behavior Study) Sacramento Municipal Utility District (SMUD)

Program Information	
How Behavior Insights were incorporated	<p>Anchor Bias: Customers in one of the treatment groups are enrolled by default unless they choose to opt out.</p> <p>Discounting the Future: Real time pricing information draws a connection between energy use and cost.</p> <p>External Barriers: Since there was no cost to consumers for participating in the pilot (either to sign-up or acquire the IHD), there were fewer obstacles preventing enrollment.</p> <p>Reciprocity Rule: Participants were given a smart meter to borrow (they did not pay for it), so they felt an obligation to use the IHD to reduce their energy use.</p>
Pilot or program	Research study, pilot
Dates implemented	June 2012–October 2013
Technology, vendor	In-home Displays, Silver Springs Network, Zigbee SEP 1.0
Interface	In-home Displays
Goals	Provide customers with real time pricing and use information, increase customer awareness of energy use, and reduce overall energy use as well as peak time (4-7pm) energy use.
Sector	Randomly selected customers were offered an IHD with a time-based pricing plan while another group was only offered a time-based pricing plan.
Geographic location	Residential customers
Intended target audience	Sacramento, California valley: hot summers, mild winters
Participating audience	15% of residential customers, anticipating a 50% opt-out rate
Funding source	18% of residential customers, only a 10% opt-out, 4,270 residential customers total
Program funding type	60% SMUD, 40% DOE ARRA SmartGrid grant
Full description	Energy efficiency
How Behavior Insights were incorporated	\$850,000
Pilot or program	SMUD's SmartSacramento project includes a consumer behavior study evaluating the impacts of time-based rates, enabling technologies, and

	recruitment treatments on energy consumption and peak demand.
Evaluation Information (if applicable)	
Evaluation Design	<p>Experimental design.</p> <p>Study design involves a sample of approximately 57,000 residential customers and a test period from June 2012 to September 2013. Due to the variety of treatments, the study involves three experimental designs:</p> <ol style="list-style-type: none"> 1. Randomized control trial (RCT) with delayed enrollment (i.e., “recruit and delay”) 2. Randomized encouragement design (RED) 3. Within-subjects design <p>In the RCT “recruit and delay” study design, a randomly selected group of customers from the study sample are recruited into a specific treatment (opt-in), but only half of those who are invited to participate are eligible to be exposed to that treatment in year one while the remainder serve as a control group on the existing inclining block rate in years one and two; however, they are permitted to enroll in the offered rates after the study period has ended in the second year. In the RED study design, a group of randomly assigned customers from the study sample serves as the control group and remains on SMUD’s standard inclining-block (tiered) rates without any form of technology offered by SMUD as part of the study. SMUD then offers a randomly selected second group of customers from the study sample a specific treatment, “encouraging” them all to accept the offer on an opt-in basis or to reject the offer on an opt-out basis, depending upon the treatment. All of these “encouraged” customers are considered in the study for evaluation purposes regardless of whether they accept or reject the treatment. The within-subjects design uses no explicit control group; instead, it estimates the effects of the treatment for each participant individually, using observed electricity consumption behavior both before and after becoming a participant in the study as well as on critical peak event and nonevent days. The control group selected for the RED design will be used to control for exogenous effects in the within-subjects design.</p> <p>Rate treatments include the implementation of three time-based rate programs in effect from June through September. SMUD is implementing a time-of-use (TOU) rate that augments its existing tiered rate structure and includes a three-hour on-peak period each weekday. In addition, SMUD is testing the effects of substituting, during the three-hour on-peak period, a higher critical peak price (CPP) on critical peak event days with either a stand-alone CPP overlay or a TOU with CPP overlay, both with an underlying tiered structure during the off-peak hours. Customers participating in any CPP rate treatments receive day-ahead notice of critical peak events, called when wholesale market prices are expected to be very high or when system emergency conditions are anticipated to arise. CPP participants are exposed to 12 critical peak events each year of the study. The rates proposed for this study are subject to formal approval by SMUD Board of Directors, which was scheduled for June 2012.</p>

	Information technology treatments include the deployment of information display devices (IHDs). These devices, in conjunction with customer Web portal access, facilitate two-way information exchange and enable customers to better manage their electricity bills through improved understanding of electricity consumption patterns of appliances and equipment. SMUD is offering the IHDs to all opt-out treatment customers and some opt-in treatment customers. All customers receive Web portal access, customer support, and a variety of education materials.
Evaluation metrics, success criteria	Energy savings; peak savings; customer satisfaction; overall engagement with SMUD; driving traffic to website and social media
Customer experience	40% of the IHDs were successfully joined to the network for the first summer. A total of 10% (420) customers reported connectivity issues, which could have been due to any of the following: The IHD is too far from the meter. May need a repeater. The IHD is operating from a battery initially The NIC card in the meter had to be rebooted The radio activation in the meter is not working Other environmental interferences within the home
Lessons learned	<ul style="list-style-type: none"> • Provisioning IHDs before sending to customers was very important and successful • Second tier support notably exceeded planned hours • New product for SMUD (define roles and responsibilities) • Minimal bids met SMUD's requirements • Bids stated <i>months</i> needed for shipping
Current status and next steps	RFP has been released for professional services contract for evaluation
Links to Additional Information	
Program website	https://www.smud.org/optimumoption/

4.9 Smart Thermostat Pilot *Connected*

Pacific Gas & Electric

Program Information	
How Behavior Insights were incorporated	<p>Anchor Bias: It was recommended to customers to keep the thermostat on a low-energy setting using the smartphone app.</p> <p>Feedback: Hourly electric and daily gas interval data was available that estimated electrical and natural gas savings.</p> <p>Loss Aversion: Messages emphasized the connection between energy use and cost, drawing on customers' tendency to avoid actions that will result in a loss of what they already have (particularly money).</p> <p>Prompts: OPower messages encouraged customers to set the thermostat to lower temperatures while they were away or asleep.</p> <p>Social Norms: Home reports compared customers' monthly electric and gas use to an average of similar homes' use as well as to an average of the most efficient 20% of similar homes.</p>
Pilot or program	Customer trial
Dates implemented	July 2012–February 2014
Technology, vendor	HoneyWell Connected Thermostat and Z-wave gateway device that communicates with the thermostat
Interface	Mobile and web applications as well as wall thermostat; behavioral messaging is available through both mobile and web applications
Goals	<ol style="list-style-type: none"> 1. Validate energy savings potential from reducing HVAC consumption through behavioral changes 2. Study residential consumer preferences and attitudes toward enabling technologies, behavior changes, and level of engagement with the thermostat <p>The goal of the trial is to test the customer experience and energy savings from the thermostat and behavioral software solution. The thermostat and associated software are intended to bring about several behavioral changes in customers with respect to how they heat and cool their homes, including:</p> <ul style="list-style-type: none"> • Drive a higher percentage of customers to program their thermostats with a custom schedule • Motivate customers to set a more efficient temperature when home • Increase setback temperatures, i.e., automating systems when customers are away from home • Expand the length of the setback period
Sector	Residential
Geographic location	Climate Zones 12, 13, and 16, specifically customers who reside in Yolo, Solano, Contra Costa, San Joaquin, Fresno, Kern and Madera counties
Intended target audience	Single family residential
Participating	Single family residential: 505 in experimental group, 505 in control

audience	group
Funding source	Energy Efficiency Emerging Technology Program
Program funding type	<p>PG&E, Opower, and Honeywell have partnered to create an innovative thermostat solution, which allows PG&E customers to remotely program and monitor heating and cooling energy use. This solution gives customers the ability to:</p> <ul style="list-style-type: none"> • Control their heating and cooling remotely from a smartphone app on iPhone or Android or an Internet connected device such as a computer • Create optimal thermostat schedules that fit their lifestyles • Get customized tips to help manage their energy bills • Get information about average similar home heating and cooling consumption within the same geographic area. <p>Trial participants have to meet the following criteria:</p> <ul style="list-style-type: none"> • Have both a PG&E electric and gas account • Have an iPhone or Android mobile phone • Have both central heating and cooling • Do not have multi-zone heating and cooling or multiple thermostats • Own a single family home, condo, or townhouse • Have broadband connection in the home with available port • Must not have any plans to move in the next 12 months • Not currently participating in PG&E's SmartAC program, with a thermostat. SmartAC Switch Customers are eligible. • Live in an eligible zip code in the Yolo, Solano, Contra Costa, San Joaquin, Fresno, Kern, and Madera counties
Full description	
Evaluation design	Experimental design; the technical approach to the test is that of a randomized controlled trial (RCT) in which the primary data of interest are the energy savings induced by the thermostat in the treatment group as compared to the control group.
Evaluation results	No significant electricity or natural gas energy savings were found at the 95% confidence level.
Customer experience	Early customer feedback indicates customers were attracted to the trial by the remote functionality, and customers generally gave high scores to the enrollment process, the thermostat itself, and to the smartphone app.
Lessons learned	<ul style="list-style-type: none"> • Improving the connectivity between the thermostat and the Internet • Ensuring that customers understand the basic operating functions of the thermostat so that it is allowed to run as a programmed thermostat, rather than simply being turned on and off like a manual thermostat • Future investigations into behavioral messaging-enabled thermostat systems should include a control group that does not receive the messaging so that the effects of the messaging itself can be evaluated • Similarly, future tests of behavior messaging thermostat products should incorporate test-and-learn messaging approaches towards the end of more thermostats being used to their full energy

	efficiency potential
Savings claimed	Trial will measure and validate energy savings claim of 5% of annual average use.
Current status and next steps	<p>Pacific Gas & Electric Company (PG&E) is conducting an Emerging Technologies Project (Project) to estimate savings opportunity for smart thermostats in 2015-16.</p> <p>PG&E will provide installation and smart thermostats free of charge to PG&E customers with residences in the North Valley, Stockton and Fresno areas who agree to participate in the Project. Upon 12 months from the installation, billing analysis will be performed to estimate energy use change.</p> <p>The installation is targeted to start in late Q3 of 2015.</p>
Links to Additional Information	
Program website	PG&E Smart Thermostat Trial
Link to evaluation report	<p>An interim report on qualitative findings is available at the link below. The report documents customer experience for a portion of what will ultimately be the full test population. This first customer group represents those recruited in the Yolo, Solano, Contra Costa, and San Joaquin counties: http://www.etcc-ca.com/reports/opower-honeywell-thermostat-trial-interim-report</p>

4.10 Smart Home Energy Monitoring Pilot *Connected*

Cape Light Compact

Program Information	
Behavior Insights	<p>Availability Heuristic: The ability to share graphs and data regarding energy savings increased the visibility of energy-conscious behaviors, creating the impression that everyone was saving. If participants observed other people saving, their self-efficacy may have increased.</p> <p>Competition: The software had the ability to offer challenges to use less, which resulted in participants having the ability to achieve a gift certificate to purchase energy efficient items.</p> <p>Feedback: Customers are provided with real time feedback of their actual electric consumption.</p> <p>Gamification: Customers could achieve points for using the system, logging in, and signing up for cost saving tasks, etc.</p> <p>Goal Setting: Customers can set a savings goal to encourage them to use less than the prior year period.</p> <p>Fairness, Inequality & Punishment: The social media component may have persuaded more customers to participate than would have otherwise since people are more likely to save energy when they know others are doing the same. : The software allowed the customer to send and receive messages and posts to engage with other participants that were interested in building and sharing their experience.</p> <p>Modeling Behavior: The social media component allows participants to show others how much energy they are saving.</p>
Pilot or program	Pilot
Dates implemented	2008-2012
Technology, vendor	Grounded Power (Phase 1) and Tendril (Phase II)
Interface	Phase 1 web interface and Phase II in-home displayed and web interface
Goals	<ul style="list-style-type: none"> • Elicit specific conservation behaviors • Compare the effectiveness of different program approaches • Save customers money • Increase customer satisfaction
Strategy, approach	Provide information; provide new technology, equipment, feedback
Sector	Residential
Geographic location	Cape Cod, Massachusetts
Target audience	100 Residential customers for Phase 1 500 Residential and 15 Commercial customers for Phase II
Participating audience	100 Residential customers for Phase 1 500 Residential customers for Phase II (no commercial)

Funding source	Ratepayer
Program funding type	Energy Efficiency
Evaluation budget	Statewide shared evaluation budget for Phase II is approximately \$130,000
Full description	<p>The first phase was launched in the summer of 2009 and is still running. Participants have a monitoring device installed in their home that gives them access to a near-real time view through a secure pilot website of their electricity use as well as a whole suite of features such as the opportunity to sign up for energy saving actions, set a goal, etc.</p> <p>In Phase II, three devices were installed: A meter-bridge that enables your meter to talk to the gateway, a Gateway that gathers the data and sends it through the Internet, and an in-home display that enables participants to see their results instantly and access the secure pilot website.</p>
Evaluation Information (if applicable)	
Evaluation design	Experimental design
Evaluation metrics, success criteria	Energy savings, customer satisfaction, increased awareness of other energy efficiency programs
Evaluation results	<p>Results of the evaluation suggest significantly different results between the two pilot cohorts: "Legacy" households using the platform developed by Grounded Power and "Energize" households using the platform developed by Tendril.</p> <ul style="list-style-type: none"> • Legacy customers' savings ranged from 7.8% to 8.8% on average per household • Energize customers' savings were significantly lower and ranged from 1.49% to 1.99% <p>Significant differences were also observed in the participation levels between cohorts. About three to six months after the pilot began, Legacy customers sharply increased their cross-program participation whereas Energize customers' monthly cross-program participation actually dropped during the pilot period.</p>
Customer experience	<p>Phase I survey interview results were positive, with the majority of the pilot participants reporting that they were satisfied with most aspects of the pilot.</p> <p>Surveys with Energize customers suggest that nearly half (47%) of them continued to use both the device and program website after 12 months but results also suggest that engagement with the device decreases over time and many customers did not access the SHEMP website at all, or did so infrequently.</p> <p>Survey results suggest that more specific, actionable educational material would be of benefit to participants and that awareness of other CLC programs was higher after participating in the SHEMP pilot.</p>
Lessons learned	The Phase I social media component was very beneficial. Participants were able to post messages, pictures, and comment on others' posts

	through the web portal internal social media platform, not through Facebook. For instance, someone might post an image of a spike in their energy use that they noticed when they plugged in a new device, or would ask an EE question of the community. Both participant feedback and the evaluation report demonstrated that this was a key component of the program.
Savings claimed	No savings intended to be claimed during the pilot phase
Current status and next steps	Since this is a pilot, Cape Cod Light is looking to learn from the evaluation if the pilot is cost-effective so that they can potentially claim savings and offer this as a measure in their programs.
Links to Additional Information	
Link to evaluation report	Phase I: http://www.capelightcompact.org/library/2010/08/3.31.10-Residential-Smart-Home-Energy-Monitoring-Final-Evaluation-Report.pdf Phase II: http://www.capelightcompact.org/wp-content/uploads/2010/08/CLC-SHEMP_Evaluation_Final-20131.pdf

4.11 DTE Insight Smartphone App *Connected*

DTE Energy

Program Information	
How Behavior Insights were incorporated	<p>Discounting the Future: Draw connections between saving energy and saving money.</p> <p>Extremeness Aversion: Energy savings tips labeled by difficulty compel customers to aim for a moderate level of savings rather than the bare minimum.</p> <p>Feedback: The app provides customers with frequent data regarding their energy use.</p> <p>Gamification: Frequent energy-savings challenges allowed customers to earn rewards.</p> <p>Goal Setting: Customers set targets through the app for how much energy they planned to use.</p> <p>Prompts: Customers received frequent tips on how they can lower their energy use</p>
Pilot or program	Program
Dates implemented	July 2014–present
Technology, vendor	Smartphone app: powerley.com
Interface	Smartphone, tablet with Android or Apple iOS operating systems
Goals	Motivate users to save energy by providing access to information and tools relating to their energy use.
Strategy, pproach	<p>The DTE Insights app seeks to engage users through a variety of features:</p> <ul style="list-style-type: none"> • Hourly (with a one day delay) interval data regarding their home energy use on a monthly, weekly, and daily basis • The ability to set targets regarding energy use to help track energy use goals • Weather overlays to help customers see how weather impacts energy use • Weekly challenges which can help users gain achievement badges and points to improve their in-app avatar • Tips for completing a variety of home projects that can help save energy and money on the users bill. The tips are labeled by difficulty of completion. • Power Scan Tool (Apple Devices): Allows customers to hold their phone over a cord and see the current energy use
Sector	Residential
Geographic location	DTE Service Territory
Target audience	Residential customers with a smartphone and advanced meter
Participating audience	Residential customers; about 150,000 total downloads to date, 100,000 unique downloads (not including users to downloaded the app more than once)

Funding source	DTE Energy Gas and Electric utility customers
Program funding type	Energy efficiency pilot, corporate funding
Evaluation budget	Still in progress
Full description	<p>DTE Insight is a program that aims to promote energy efficiency and engage customers through the DTE Insight smartphone application. The app originally became available to Apple devices in July 2014 and Android devices in August 2014. While originally only able to show electric use data, the app began showing gas use data to DTE gas and combo customers in December 2014.</p> <p>DTE customers can download the app for free through the “App Store” and can access their use data after signing in with their DTE information. Customers can also download the app for multiple devices. The app engages customers through the strategies described above.</p>
Evaluation Information	
Evaluation design	<p>Matched Control Group: matched by electricity use in the 12 months preceding the program</p> <p>Two statistical tests:</p> <ul style="list-style-type: none"> • Regression with Pre-program Matching (RRPM) • Matching with Bias Correction (MBC) <p>Surveys to assess self-selection bias</p>
Evaluation metrics, success criteria	Energy Savings
Evaluation results	<p>Based on six months of data from 8,940 participants:</p> <p>App successful at encouraging DTE customers to participate in other energy efficiency programs such as Appliance Recycling, Home Energy Survey, and Home Energy Consultations.</p> <p>This finding suggests that joint savings between the App and other programs should not be double counted.</p> <p>After removing joint savings, the evaluation suggested that DTE Insight App results in, on average, 1.06% electric energy savings with a 90% interval.</p>
Customer experience	Insight app users tend to be homeowners, live in single-family detached homes and use natural gas to heat their homes. The vast majority of surveyed participants said they were likely to recommend the app to others. Many participants said they initially downloaded the app out of curiosity, and because they wanted to get information about their energy use.
Lessons learned	Results suggested that savings are subject to self-selection bias - 21% nonparticipants indicated they had a smartphone and had heard of the app but chose not to download it. Of these 21%, 47% said they were not interested in the app or did not think it would be useful to them.
Savings claimed	1.06% electric deemed savings for 2016

Current status and next steps	Program has been commercialized since July 2015. New features continue to be evaluated and integrated into the customer experience to improve customer savings.
Links to Additional Information	
Program website	
Link to Evaluation Report	http://www.michigan.gov/documents/mpsc/DTE_Insight_MEMD_White_Paper_06012015_491804_7.pdf
Images	

4.12 Save Power Day - PTR Program / PTR-ET-DLC (Peak Time Rebate-Enabling Technology-Direct Load Control) Study Connected Southern California Edison

Program Information	
Behavior Insights	Reciprocity Rule: Customers were given rebates in exchange for agreeing to use less energy during specified events.
Pilot or program	Study
Dates implemented	Summer 2013. Five events called between July 2nd and September 9th
Technology, vendor	PCT—Programmable Communicating Thermostat, Nest Thermostat, and Energy Hub (EH) select dealers
Interface	Smart thermostat via broadband and cloud connection, SCE used Open ADR as the communication protocol to notify Nest and Energy Hub of the DR event. Nest and EH notify customer of PTR event notification through phone, text message, or email.
Goals	SCE’s PTR program, called Save Power Day, is designed to encourage residential customers to reduce load by responding to the availability of a pay-for-performance incentive during PTR event periods.
Strategy, approach	Use peak time rebates to encourage customers to shift energy use off-peak during specified events. Encourage customers to directly enroll in notifications of PTR events by email, text message, phone. All enrollments are through the vendor’s Nest and EH web portal. The web portal can be accessed from a smart phone, laptop, desktop or tablet. Customers are notified of the event via their email, smart thermostat, text message. 2013—Provide DR capabilities for PTR events for households by incorporating third-party PCTs installed in the home with the aim of increasing customer participation in PTR program and ultimately load shifting potential.
Sector	Residential
Geographic location	California, entire SCE service territory
Target audience	All SCE Residential Customers. Most residential customers with SmartConnect meters installed and operational eligible
Participating audience	All SCE Residential Customers with limited exceptions
Funding source	Ratepayers
Program funding type	The Study was funded through the DR Emerging Technologies budget. Once the Study transitions to a full fledge program in 2015, funding will come from the Peak Time Rebate (PTR approved tariff).
Evaluation budget	3 rd Party EM&V performed by Navigant via DR Load Impact Study

Full description	<p>The Peak Time Rebate program encourages residential customers to reduce their energy consumption by making behavior changes in energy use during demand response events. During these events, customers are eligible for bill credits in return for reducing their energy use. The credits are calculated based on the customers reduction in energy use on the day of the event below their established, customer-specific, reference level. Customers generally earn \$0.75 per kWh reduced.</p> <p>Events can be called on a day ahead basis on non-holiday weekdays throughout the year but have only been called during the summer to date. Bill credits can be earned between 2:00 and 6:00pm on the day of the event. Event notification is day ahead via email, text, and phone alerts.</p> <p>In 2013, SCE expanded the program to give customers with approved enabling technologies, such as PCTs, the opportunity to earn an additional \$0.50 per kWh reduced, providing a total incentive of \$1.25 per kWh. SCE partnered with Nest and EnergyHub on their residential demand response programs study to introduce these capabilities.</p>
Evaluation Information (if applicable)	
Evaluation design	<p>A load impact evaluation was conducted for three customer segments using a matched control group drawn from the customers that did not receive PTR event alerts. The impact evaluation was limited to PTR customers who received notification of 2013 events.</p> <p>Customer Segments Evaluated:</p> <ol style="list-style-type: none"> 1. <i>Opt-in alert PTR customers</i> (Opt-In): Customers that voluntarily enrolled in PTR event notification by phone, text message, or email (~206,000 customers) 2. <i>Default alert PTR customers</i> (Default): My account customers that were defaulted onto PTR event notification through email (~600,000 customers) 3. <i>Third-party PCT customers</i> (PCT): Customers that have a PCT and participated in the third party PCT study, which enabled demand response during 2013 PTR events (~2,800 customers)
Evaluation metrics, success criteria	<p>Estimated hourly ex post load reductions on the five 2013 PTR event days (aggregate and per-customer level)</p> <p>For opt-in PTR customers, forecast 2014–2024 PTR hourly ex ante load impacts for a 1-in-2 and 1-in-10 weather year by month (aggregate and per-customer level)</p>
Evaluation results	<ol style="list-style-type: none"> 1. <i>Opt-in</i> : All impact estimates were statistically significant; Average load drop of 0.08 kW per participant; aggregate load drop from 2-6pm was 11.9 MW (over, on average, 157,737 participants per event) resulting in a 4% load reduction; relatively constant load reduction across all five events (0.07-0.09 kW) 2. <i>Default</i>: Little evidence of load reduction; Average load drop 0.03 kW per participant; 1.5% load reduction, not statistically significant; aggregate load drop 17.9 MW (over 587,642 participants) 3. <i>PCT</i>: Average load drop 0.75 kW per participant; aggregate load

	<p>drop 1.0 MW (over 1,344 participants); 29.8% load reduction</p> <p>2014-2024 Forecast (Opt-in PTR): Once enrollment reaches a steady state (estimated for 2015), ex ante estimates suggest PTR program will be capable of producing 15.6 MW aggregate load reductions during August peak under 1-in-10 weather conditions (14 MW aggregate reduction in August 1-in-2 weather conditions)</p> <p>Nest and EnergyHub Study:</p> <p>Comparison of SCE meter data and Nest and EH load reduction estimates suggest Nest and EH can predict load reductions even without meter data.</p>
Customer experience	<p>From Nest report (results include SCE and other Nest partners Austin Energy and Reliant):</p> <ul style="list-style-type: none"> • Only 14.5% of participants across all Nest pilots changed the thermostat temperature during events; these customers still shifted an average of 0.61 kW overall • 84% of customers reported minimal to no impact on comfort level during events <p>SCE specific:</p> <p>Customer inquiries were few (less than a dozen in 2 years of study). Program enables customer choice so customers can opt out of the event if they want. Since it is a pay for performance based program, opting out will lower the customers potential incentive</p>
Lessons learned	<p>From Nest:</p> <p>As compared to SCE’s four hour events, the two hour events held by Austin Energy and Reliant had fewer temperature change events, lower temperature increases, and higher load shift rates.</p>
Savings claimed	<p>SCE is not currently claiming energy efficiency savings (EE), but hopes to as statewide work paper on smart thermostats is submitted and approved.</p>
Current status and next steps	<p>SCE has transitioned from study in 2013 and 2014 to a program in 2015</p>
Links to Additional Information	
Program website	<p>SCE is currently updating its website on smart thermostat and associated program</p>
Link to evaluation report	<p>The DR load Impact Study</p>
Images	

4.13 Continuous Energy Improvement (CEI) Pilot *Connected* Efficiency Vermont

Program Information	
Behavior Insights	<p>Feedback: Providing feedback to customer energy teams on progress to energy savings goals as well as impact through regression models.</p> <p>Goal Setting: Establishing savings goals that are tied to dollars saved affects organizational buy-in.</p> <p>Interpersonal Communication: Work with target audience to identify ways of reducing energy use.</p> <p>Messenger: Providing information to elicit energy efficiency activities through experience and expertise of staff and consultants</p> <p>Modeling Behavior: Using the cohort approach provides opportunity for energy teams from different organizations to strategize and implement efficiency programs, guiding how organizations behave.</p> <p>Public Commitment: A commitment workshop for each cohort serves as the tool to gain active participation. A letter of commitment is executed to bring about effective long-term participation.</p> <p>Self-Efficacy: Personalized and specific energy-saving tips increase customers' confidence in their ability to decrease their energy use.</p> <p>Social Norms: Tactical employee engagements amongst the cohort representatives to identify strategies and methods to proliferate across individual organizations.</p>
Pilot or program	Pilot
Dates implemented	1/1/2014–Current
Technology, vendor	EMIS through SENSEI (regression modeling software)
Interface	Real time energy management, and systematic measurement, facilitated by extensive customer engagement through Account Management focused on employee engagement, capital improvements, process improvements, and maintenance.
Goals	Provide education or training to the target audience, Elicit specific conservation behavior(s), Base load reduction, Peak load reduction, Save customers money, Increase customer satisfaction, Increase uptake (downstream) of efficient products or measures, Increase uptake (upstream) of efficient products or measures, Make progress towards market transformation
Strategy, approach	<ul style="list-style-type: none"> • Provide general energy efficiency behavior information or marketing • Engage target audience in identifying and implementing potential efficiency improvements in their own home or facility • Indirect Feedback: In-Person Energy Audits (of homes or businesses) • Install or provide new equipment or other efficiency measures • Provide incentives such as rebates, discounts, and/or gifts for reduced energy use or new equipment to manufacturers or retailers

	<ul style="list-style-type: none"> • Research: assess program efficacy
Sectors	Commercial, Industrial
Geographic location	Vermont, USA
Target audience	Large commercial owners, operators, or occupants: Industrial, Institutional, Health Care, Ski Area
Participating audience	8 C&I organizations located in Vermont.
Funding source	Vermont Rate Payers
Program funding type	Resource Acquisition, Research and Development
Evaluation budget	Not available
Full description	Continuous Energy Improvement (CEI) is an approach designed to reduce energy intensity over time for large C&I customers. The target market for this initiative includes approximately 50 of the state's largest energy users. Designed appropriately, this type of program can benefit not only industrial customers but also large institutional and commercial customers. The approach is characterized by demonstrated customer commitment, assessment and planning, increased levels of real time energy management, and systematic measurement, and facilitated by extensive customer engagement through Efficiency Vermont Account Management outreach.
Evaluation Information (if applicable)	
Evaluation design	Evaluation underway: Impact Evaluation, Market Effects Evaluation
Evaluation metrics, success criteria	Customer engagement, behavioral savings estimates, cost-effectiveness
Customer experience	Customers value the focus on facility wide energy management including engagement of multiple levels at their facility and EMIS allowing each customer to measure progress against a normalized baseline.
Lessons learned	EMIS implementation needs to be quick in order to capture the interest of the customer
Savings claimed	Behavior savings from the pilot are not currently claimed
Current status and next steps	Currently awaiting the results of the year 2 evaluation and recruiting the cohort of new participants for year 3.
Links to Additional Information	
Program website	Continuous Energy Improvement Pilot
Images	

Rock the Bulb *Not Connected*
Puget Sound Energy

Program Information	
How Behavior Insight(s) were Incorporated	<p>Cognitive Dissonance: After collecting free energy-efficient light bulbs in exchange for their inefficient bulbs, customers were more likely to start thinking of themselves as energy efficient and further engage in acts that save energy.</p> <p>Competition: Approximately 5,300 customers signed up for a competition where they earned points by engaging in energy efficient activities, with the chance to win rewards.</p> <p>Confirmation Bias: When trying to get customers to adopt LED technology, they chose to reach out specifically to those who were likely to already be using CFL bulbs and would be open to taking the next steps instead of customers who had yet to take the first step toward efficiency.</p> <p>External Barriers: Rock the Bulb made it easy for PSE customers to participate by having events in many locations and allowing customers to exchange up to 15 incandescent light bulbs for no cost.</p> <p>Heuristics: Rock the Bulb had a fun, festival atmosphere, forging a positive image of energy efficiency in the customers' minds.</p> <p>Messenger: Puget Sound energy experts were present on site to present customers with interesting and relevant information about energy efficiency. In fact, 97% of customers rated the information presented as relevant and PSE as a good source for efficiency information.</p> <p>Perceived Benefits & Drawbacks: Customers saw the benefits of switching to energy efficient light bulbs as far outweighing the costs, given that up to ten bulbs were given out for free when customers recycled their inefficient bulbs. They also appreciated that they were better for the environment</p> <p>Sunk Costs: By giving away free efficient bulbs, PSE convinced customers to give up the inefficient bulbs that had already been paid for and installed.</p>
Dates implemented	2009, 2010, 2012
Pilot or program	Campaign
Type of interface	Advertising and outreach
Sector	Residential
Geographic location	Washington State
Target audience	1 million residential customers identified as "green idealists" and "practical idealists" who are or have been PSE residential electric customers.
Participating audience	Each year had over 6,000 households present at a Rock the Bulb event and the total reach of the campaign was over 150,000 customers per year.

Funding source	Ratepayer Other
Behavior change category	Increase Technology Adoption Change Default Practices or Culture
Qualitative Goals	<ul style="list-style-type: none"> • Provide education or training to target audience • Increase uptake (upstream) of efficient products or measures • Increase uptake (downstream) of efficient products or measures • Elicit conservation behavior
Strategy, approach	<ul style="list-style-type: none"> • Provide more targeted energy efficiency behavior information via community • Provide incentives for reduced energy use or new equipment • Engage target audience in identifying and implementing potential efficiency improvements in their own home or facility • Build support for Rock the Bulb by reaching out to community organizations who could support the campaign by spreading the word • Create a fun, family-friendly, festival atmosphere
Description	<p>Puget Sound Energy's Rock the Bulb Campaign was an outreach effort designed to educate PSE's residential electric customers about the many benefits of using energy efficient products in their home and help them acquire these products. The campaign involved eight events in various locations throughout the summer with booths to exchange incandescent light bulbs for CFL bulbs and booths to learn more about efficiency. To incentivize customers to visit each booth, customers were rewarded with a water-saving showerhead if they got their "passport" stamped at each location. In 2012, in addition to CFL and educational booths, two events were held to distribute the more energy efficient LED bulbs.</p>
Evaluation Information (If Applicable)	
Evaluation design	Nonexperimental
Evaluation metrics, success criteria	<ul style="list-style-type: none"> • Number of CFL and LED bulbs distributed • Number of incandescent bulbs collected • Customer participation • Customer satisfaction • Follow-through on energy efficient behaviors
Evaluation results	<p>In 2012 the Rock the Bulb Campaign yielded excellent outcomes: 84,000 incandescent light bulbs were exchanged for 75,000 ENERGY STAR-qualified compact fluorescent bulbs, over 6,000 households participated with a 97% customer satisfaction rate, and there were high follow-through rates: 70% of CFL bulbs were installed by attendees along with 30% of showerheads, and 67% of customers claimed to turn off lights more frequently and 45% to unplug electric devices more often. These results were comparable to those of the 2009 and 2011 events.</p>
Customer experience	<ul style="list-style-type: none"> • The majority of customer responses were appreciative • A survey completed by 1,621 attendees revealed that 97% of customers agreed to some extent that the information presented was relevant to them and that PSE was a good source of energy

	<p>efficiency information</p> <ul style="list-style-type: none"> • The same survey showed that 98% of participants thought the event was worth their time
Lessons learned	<ul style="list-style-type: none"> • Planning for campaigns should begin 6+ months before first event • Weekly committee meetings are necessary to keep the team on track • Approach major sponsors at least 10 months in advance • Partnerships were key to the successful implementation of the Rock the Bulb campaign
Savings claimed	<p>Each year had carbon dioxide emission savings equal to taking 2,670 cars off the road.</p>

4.14 The 20/20 Challenge

FortisBC

Program Information	
How Behavior Insight(s) were Incorporated	<p>Foot-In-The-Door: Program administrators ask people to make a bigger change after a small initial action.</p> <p>Public Commitment: Customers are asked to commit publicly to specific actions they will take to reduce their energy consumption.</p> <p>Single Action Bias: This program helps participants avoid the tendency to stop exhibiting energy-conscious behaviors after the first action by asking them to commit to further actions immediately after the first.</p>
Dates implemented	2009
Pilot or program	One-time promotion for 20 th anniversary
Sector	Residential
Target audience	150,000 homeowners between the ages of 25-65
Funding source	Ratepayer
Behavior change category	Increase Technology Adoption Change Default Practices or Culture
Qualitative goals	Increase uptake (downstream) of efficient products or measures
Strategy, approach	Provide new equipment or other efficiency measure
Description	<p>This program applies insight about public commitment by asking participants to make one small energy efficiency change and then commit to making another change. When participants bring in old light bulbs to exchange them for CFLs, they are asked to pledge to reduce their energy use in at least one other way, such as by installing better insulation in their home or better managing their use of heat in their home.¹⁰⁴ FortisBC's 20/20 Challenge program is also an example of an effort to avoid the Single Action Bias. The 20/20 Challenge program reaches customers just as they are performing one behavior change (trading their old incandescent bulbs for more efficient CFLs), which is when these customers are the most vulnerable to the Single Action Bias. By bringing in old light bulbs to exchange them for CFLs, people will likely feel they have satisfied their obligation to energy efficiency. Yet the 20/20 Challenge takes this opportunity to prompt customers to look ahead to what energy efficiency step they plan to take next, which may help counteract the Single Action Bias.</p>
Evaluation Information (if applicable)	
Evaluation design	N/A—Not formally evaluated. Savings deemed.
Customer experience	Extremely positive. Almost a party atmosphere as customers waited in line to trade their light bulbs. Customer satisfaction surveys achieved highest ratings ever after the promotion.
Lessons learned	Partnering with local governments whenever possible (used city halls as distribution sites, local politicians helped distribute the produce) was extremely successful. It helped build credibility and on-going relationships.
Savings claimed	Deemed savings for incandescent replacements with CFLs.

Closing Thoughts

Energy efficiency programs have only begun to scratch the surface of all the potential ways that the energy savings impacts of Connected technologies could be enhanced through the incorporation of social science knowledge. Our intent is that this document shed light on how energy efficiency programs have incorporated both two-way technologies and behavioral insights to date and provide some early thoughts on which behavioral insights might especially lend themselves to use in Connected programs. Looking ahead, gaining a better understanding of which behavioral insights might be particularly conducive to spurring energy savings for which connected devices will allow programs to achieve additional untapped savings.

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