Scalability of Successful Behavior Change Programs

Mary D Zalesny, Pacific Northwest National Laboratory, USA
Shahana Samiullah, Southern California Edison, USA

Abstract

Efforts to change energy use behaviors are generally based on behavioral theories, but appear to incorporate elements of the theories selectively. They also focus primarily on the drivers that initiate behavior change rather than also including those associated with the maintenance or persistence of new or changed behaviors.

Behavioral change in the short term, while not a sure bet, is relatively easy. Behavioral change for the long term is hard. Studies suggest it takes from three weeks (for a simple habit) to 8 months (for a complex one) to form a new habit (Lally et al. 2010). This paper will explore some widely accepted theories of behavior change (its initiation and persistence) that have been used as the basis for current demand-side management (DSM) programs to affect consumer energy use. In this paper, behavior-based energy efficiency (BBE) programs are defined to influence customer energy use behavior through feedback, comparison, outreach, education, competition and rewards. These programs generally target ongoing, habitual behaviors (e.g., turning off lights in unoccupied rooms) and one-time behaviors (e.g., installing CFLs, installing energy-efficient windows, and major purchases).

The paper considers the scalability of programs that have had some success in the short term (e.g., community based marketing, nudge theory, social norms, etc.). It also addresses individual differences and local conditions necessary for successful scalability to much larger populations and over extended periods of time. The evaluation of programs and approaches that appear to be successful at a local or small scale must consider the likelihood of success on a larger scale.

Behavior-Based Programs

Rebates and incentive programs to encourage energy conservation have been used widely by public utilities in the US (American Public Power Association 2009). Energy conservation has also been supported through federal government tax credits, although programs were for a limited period and capped the credit (US Department of Energy 2014). Behavior-based energy efficiency (BBE) programs, as defined above, attempt to influence customer energy use behavior through feedback, comparison, outreach, education, competition and rewards. They focus on both ongoing, habitual behaviors (e.g., turning off lights in unoccupied rooms) and one-time behaviors (e.g., installing CFLs, installing energy efficient windows, etc.). Recommendations about energy-efficient products also target purchase behaviors and may be combined with rebates, rewards and other programs (State and Local Energy Efficiency Action Network 2010). While these programs may aim for long lasting behavior change, they may have only short-term effects. BBE programs need to consider both short-term and long-term behavioral effects.

Challenges to Implementing Behavior-Based Energy Efficiency Programs

Decades of research on human behavior have produced at least one consistent finding: a lasting change in behavior is difficult to achieve. The difficulty grows exponentially when someone else (e.g., a change agent) is trying to change others' behavior. In self-initiated behavior change, individuals choose what behavior to change, are self-motivated, have sufficient self-understanding to know how to approach changing their own behavior or can use resources (e.g., personal trainer or coach, self-help groups, etc.), have self-set goals, and usually have family and friends to provide encouragement and support.

There are also numerous challenges to self-initiated behavior change, most important being well-learned habits that are resistant to change. Additionally, conscious effort is required to engage in the new behavior; there may be unanticipated consequences (e.g., weight gain and mood changes with smoking cessation) that undermine efforts to change behavior; it's demotivating when it takes longer to reach the goal than planned or expected; family and friends may not provide the level or duration of encouragement and support needed to achieve the goal; selected goals are too easy or too hard; and there may be no or insufficient learning from previous, unsuccessful attempts (Ryan et al. 2011).

When the goal to change behavior belongs to someone else, e.g., a spouse, family member or friend, a commercial enterprise, or a government agency, the challenge includes convincing, compelling or forcing one or more people to do (or refrain from doing) something they may not want to do (or stop doing), or may not care about (DeYoung 1993). The difficulty is compounded if (a) some or all of the people are unknown to the agent attempting the change; (b) little is known about the motivations, habits, and abilities of the target population; and (c) a majority of the population does not want to change their behavior or has different beliefs about the extent to which they are willing to change. (Wakefield, Loken & Hornik 2010)

Commercial enterprises constantly attempt to change others' behavior, as seen in ever-present marketing and advertising. However, whereas commercial enterprises emphasize purchasing behaviors, energy conservation is concerned with both purchasing and saving behaviors. Long-standing models and assumptions about customer energy use behaviors based on reasoned and instrumental decisions have incorporated more holistic management strategies to affect energy consumption (Randazzo & Peters 2011). In the next section, we explore and summarize for the readers the relevant behavior change theories of interest and importance to understand the scalability challenges faced by BBE programs.

Relevant Theory and Research on Behavior and Behavior Change

We briefly summarize in this section what is known about human behavior as it relates to energy use. The theories presented and discussed here focus on the factors that will influence people to attend to the type of information frequently presented in BBE programs that leads to/prompts action on the information (e.g., reducing energy use, using more energy-efficient products, etc.). After a brief summary of research on habit and routine as determinants of behavior, we will consider major behavior and behavior-change theories that form the basis for most BBE programs.

Habit and Routines

Most behavior—including energy use behavior—is habit or routine based. While habits may evoke a negative connotation suggesting inflexibility, they are very useful in negotiating daily life by

improving both cognitive and behavioral efficiency (Lutzenhizer 2009 and Sullivan 2009).   Once learned and established, habits are performed automatically, freeing up capacity to do other things that require cognitive effort. As anyone who has experienced an unexpected change in getting to work or completing a routine task knows—interruption in or disruption of a well-established habit can adversely affect the rest of the day (Wood, Labrecque & Lally 2011 and Kahneman 2011).

There are also incentives associated with habits that have developed overtime that maintain the behavior. To break a habit one must: become aware of the behavior (think about what you are doing), remove the incentives supporting the behavior, avoid or control the negative consequences from not performing the routine behavior, and find rewarding alternatives (Egmond & Bruel 2007).

Studies suggest it takes from three weeks (for a simple habit) to 8 months (for a complex one) to form a new habit (Melton 2011). Changing energy use that is part of a habit or routine behavioral sequence means deconstructing routine consisting of multiple, connected behaviors, attending to the energy use behaviors, altering the energy behaviors, and re-establishing a new routine. A successful outcome requires time and commitment.

Theories of Planned Behavior or Reasoned Action

Most of the research on energy use behaviors has drawn on theories of planned behavior or rational action to explain choices made by energy users and try to influence the selection and performance of energy-saving behaviors. Theories of planned behavior or reasoned action focus on behaviors that require some cognitive effort (usually choice from among options) to complete. Theories in this category consider both internal and external factors that affect behavioral choices. Internal factors include attitudes, values, norms or capabilities and encompass issues of what people want to do, believe they should do and believe they are capable of doing. External factors include contextual, circumstantial and physical supports or constraints to behavior, e.g., cost, policies and regulations, and physical capabilities.

Reinforcement Theories of Motivation

Reinforcement theories of motivation explain behavior as a function of its consequences. Essential to effectively using reinforcement or punishment to motivate individuals to perform (or not perform) specific behaviors are knowledge of what individuals perceive as rewarding or punishing and the schedule of reinforcement to establish and maintain a desired behavior (Wagner and Hollenbeck 1992). Because rewards can be either external (e.g., money, gifts, services, recognition) or internal (e.g., feelings of accomplishment, belonging, satisfaction), determining which types of rewards are more important to individuals can make the difference between effective and ineffective behavior-based programs. Maintaining the best schedule of reinforcement can be complicated when the number of target individuals is large and there are a variety of rewards available. Finally, the timing of the rewards is important in establishing a new behavior and inconsistent reinforcement at that stage can undermine the reinforcement approach (Ferster & Skinner 1957).

Current BBE programs appear to recognize that a variety of rewards is necessary to ensure that rewards are valued across customer groups. The rewards are mostly external (e.g., money saved, discounts at local or national businesses, and rebates), although much of the positive feedback provided for reduced energy consumption over a period of time can generate a sense of accomplishment that is internally rewarding. Because of the size and diversity of the population, BBE programs may not be able to administer an effective reinforcement schedule to establish and strengthen the connection between reduced energy consumption and rewards. However, some level of individualization can be created by focusing on customer segments. Through demographic, personal and market data and consumption patterns, groups that may share similar characteristics

and values can be identified for targeted communications and rewards. By varying when specific rewards are available and in what quantity, some diversity in the schedule of reinforcements for energy reduction behaviors can be achieved. The timing of rewards is dependent on customers reporting on their energy reduction behaviors (e.g., through rebate programs) and compiling energy measurements for billing purposes and reward distribution. The longer the delay between actual energy reduction behavior and rewards, the weaker the connection between behavior and reward, and the less powerful the effect of the rewards over time.

Goal Setting

The use of goals to guide behavior and performance is hardly new (Taylor 1911). At its core, this approach to achieving an objective—whether on a personal, group, organizational or societal level—is to set a goal and work towards it. What we've learned from over 40 years of research is that goals need to be: specific rather than vague (e.g., "reduce energy use in your home/office by 5% over the next 6 months" vs. "try to save more energy in your home/office this year"), and challenging, but reachable. Specific and difficult goals encourage greater effort and persistence (Locke et al. 1981) and help focus efforts on what's important and what level of performance is needed to reach them (Locke & Bryan 1969). Feedback on one's progress toward the goal keeps people on track by maintaining or changing their effort as required.

Several behavior-based energy programs incorporate the lessons of goal-setting research by asking customers to set goals or select from goal options. For example, BBE programs may ask customers to choose from goals of 5%, 10% or 15% reduction in energy usage for different rewards at each goal level, and provide feedback on monthly progress toward customer goals (e.g., saved less or more than their set or selected goal). Such programs suggest actions customers who are below their goal can take to achieve their goal and also suggest a higher goal level to customers whose energy savings are above their goal level. An important factor in whether goals will be met is an *individual's commitment* to that goal (Locke & Latham 2006). The higher the commitment, the more likely the goal will be achieved. The more difficult or challenging the goal, the more important goal commitment becomes.

Most BBE programs do not ask for or measure customer commitment to the energy reduction goals they are encouraged to set. The offer of rewards for reaching goals may help overcome resistance to energy goals, however, the rewards may become an end itself. Studies have shown that goal-directed efforts drop off when rewards they were associated with are discontinued—i.e., new behaviors are extinguished without reinforcements to help the behaviors become routine (Locke et al. 1981).

Some research suggests that while setting goals tends to facilitate performance on all tasks, the size of the effect is larger for simple versus complex tasks (Wood, Mento & Locke 1987). The implication for energy consumption behaviors is that goal setting is likely to have a greater effect when the behaviors are relatively easy to perform (e.g., switching to CFL bulbs, turning off lights in unoccupied rooms, etc.) than when the behaviors are more complex (e.g., installing high efficiency windows, adding insulation, switching to renewable energy sources, etc.). However, the more complex energy use actions are also the ones likely to reduce energy consumption the most (Wood, Mento & Locke 1987).

Theory of Planned Behavior

The theory of planned behavior (Ajzen 1991) was developed to predict and explain behavior in specific contexts and has been used as a basis for several energy-related behavioral interventions (Abrahamse and Steg 2011). Central to understanding and predicting behavior in this approach is a

person's intention to perform a specific behavior. However, *intentions come into play only if the behavior is under a person's control—they can decide to act or not act in a specific situation.* Intentions are also influenced by the *context and other external factors* (e.g., having opportunities and adequate resources to perform the behavior). Intentions to act or not act are dependent on an individual's attitude toward the behavior, their perception of social pressure to act or not act, and perceived control over performing the behavior. Two important qualifications to predicting the performance of a specific behavior are the relative importance of the attitude, subject norm and perceived behavioral control, and the actual control an individual has over performing the behavior.

Application of the theory of planned behavior to energy behaviors has focused primarily on changing personal beliefs about specific energy reduction behaviors and about how important others (influential people in one's life) evaluate specific energy reduction behaviors, and, to a lesser extent, influencing one's perceived ability to perform the energy behaviors.

A major challenge for BBE programs using this approach is determining and influencing a sufficient number of salient beliefs or introducing new beliefs to change an attitude toward a specific energy reduction behavior. Most programs in the US (e.g., OPOWER, Aclara, C3, Duke Energy, KCLP) include general information to customers to clarify uncertainties, correct inaccurate beliefs, or dispel fear or concerns about consequences of performing specific energy reduction behaviors. If people do not see the connection between a change in their behavior and valued outcomes, the desired behavioral change may not occur or may not be sustained over time. Also, the elements of the BBE program must be specific and relevant to the target population. This latter requirement means utilities must determine relevant population segments likely to share similar characteristics, values and beliefs.

Like goals, intentions must be specific (where, when, how, and how much). Although the theory of planned behavior does not require that intentions be challenging, it is clear that energy users must not only believe that they are able to perform a specific behavior, they must actually have the ability to perform the behavior.

Expectancy Theory

In expectancy theory, the key determinant of behavioral choices is motivational force—or relative pull or push—of potential behaviors (Vroom 1964). Motivational force is a function of three factors: expected perceived value or desirability of outcomes available for various behaviors including inaction; expectation or belief that effort will lead to a desired level of performance of a behavior; and expectation or belief of a positive relationship between the level of performance and achieving the desired outcomes. The level of performance really matters—if just any performance is rewarded, there is no incentive or force to exert greater effort. Individual needs, goals, values, and preferences affect the perceived value of potential outcomes.

Applying expectancy theory to BBE programs requires that energy providers understand customer beliefs about whether the efforts they make to perform energy-related behaviors will lead to valued outcomes. This means gathering information from customers or making inferences based on marketing and other research on customers' perceived abilities to perform various energy-related behaviors, their past experience performing energy-related behaviors at home or work, the desirability of various outcomes for performing specific levels of energy reduction behaviors, their perceived and actual control over performance to achieve energy savings, and the level of trust that customers have in the utility to honor its commitments to reward energy reduction behavior. Even for small or local BBE programs, that's a lot of detailed information about people to understand or make inferences about.

BBE programs that incorporate some or all of expectancy theory tenets—whether explicitly or inherently—involve customers in identifying energy-saving behaviors that they have control over

and believe they can accomplish. The programs also provide a variety of outcomes for performing energy-related behaviors and allow customers to select from among outcomes. The programs also provide support (advice, resources, and training) that will increase customer capabilities in performing energy-related behaviors that they may not have had past experience with. While programs that include in-person contacts with customers may be more resource intensive and may not reach as many customers, they have the potential to achieve longer lasting changes in energy behaviors. Key to programs based on expectancy theories is customer willingness to share information about themselves with the energy provider (or third party operating an energy saving program).

Theory of Interpersonal Behavior

The Theory of Interpersonal Behavior explicitly considers the role of habit in understanding and predicting behavioral response (Triandis 1977). According to this theory, behavior is a function of intention, habitual responses, and situational constraints and conditions. Intention is influenced by social and affective factors and cognition (reasoning). Social factors include both group (i.e., norms or social rules about behavior, and roles or sets of behaviors expected of people in specific positions) and personal constructs (i.e., perception of self, personal goals, and predispositions to behave in certain ways). Affect or attitudes represent the individual's emotional response to specific behaviors and choices (Triandis 2011).

The theory of interpersonal behavior defines norms as social rules about acceptable behavior in specific situations. Many BBE programs that base some of their communications to customers on 'social norms' or 'injunctive norms'[1] do not actually tap into social norms to affect customer behavior (Feldman 1984). Rather they provide comparative information about the energy use of others (most often neighbors) that—depending on the cohesiveness of the neighborhood—may or may not be important to customers. Information about neighbor energy consumption may stimulate an evaluation of one's own energy usage, but is not equivalent to using social norms to influence behavior change. Whether or not BBE programs are tapping into social norms is important because of the power of social norms to influence behavior (Cialdini & Goldstein, 2004).

Unless there is a strong sense of "being a group" among the households in a neighborhood or community, it's unlikely that information provided by a third party about energy usage in the area will have the same effect as a social norm. If there is a strong sense of community and close interactions among neighbors, it's likely they already have a good idea of how much energy each other uses.

Illogical/Unreasoned, but Predictable Behavior

Like habits, heuristics are generally applied automatically. While they can also be highly effective for making judgments or inferences under conditions of uncertainty, heuristics are often applied inappropriately (Nisbett & Ross 1980) or in clear contradiction of the rules of probability. The tenaciousness of heuristics as a common cognitive strategy has led to their use being referred to as illustrative of illogical or unreasoned, but predictable, behavior.

Heuristics principles suggest that under uncertainty, people will make decisions using information that is easily recalled from memory (Tversky & Kahneman 1974). To be stored and available for recall, information about people/things/events must be noticed. Information about people and objects that are familiar or highly unusual is most likely to be noticed, stored and

---

[1] Behaviors perceived as approved or disapproved by others within a culture.

subsequently recalled. BBE programs that tap into things that are familiar to customers or that are highly unusual are more likely to be attended to and recalled at a later time when a judgment or decision is required.

When information is limited, people will also rely on stereotypes (for people) or scripts (for events) to make decisions because it's more efficient and can be effective to use them, especially if the judgment is not about an important issue. When people begin with a starting value about an object, person or event (e.g., the amount of energy they/their neighbors use over a period of time), that value becomes an anchor against which future decisions are made. Adjustments to that value will generally be smaller than they should be as new information is acquired. People also tend to have a narrow confidence range about the accuracy of their estimates, including their adjustments. The adjustment and anchoring heuristic can affect successive goal setting in BBE programs by leading to smaller goal increases that would be expected based on achieved goals.

Relevance to Energy Use Behaviors

All of the theories discussed above are relevant to and can be used to help improve the design, implementation and guidance for evaluating successful BBE programs' scalability. Habits and heuristics are likely to control most energy-related behaviors for the majority of the population. Habits can be changed, but it requires time and commitment from the individual whose behavior is under consideration for change and from the entity attempting to affect the change. Heuristics may have limited relevance for the kinds of decisions and judgments made about energy use.

Regardless of behavior theory, it is clear that if the underlying aspects important to customers' lasting behavior change are not addressed, the BBE programs are likely to have smaller than estimated potential effectsin a DSM portfolioEvaluation of these programs will need to assess how well the programs have addressed targeting of specific customer behavior and habits in ways that can be determined to sustain over time.

Unless BBE programs can help create new habits, tap into what is important to people or make energy efficiency an important value, the outcomes of their approaches (e.g., norming and gamification) are unlikely to be sustained over time. The attractiveness of programs and their ability to capture attention will decline if the approaches do not align with important beliefs or values.

Residential and Commercial Energy Users

Residential and commercial customers have very different energy requirements and have different expectations of their energy providers. Most of the research on energy use behaviors has considered/involved residential energy use. To improve the chances of success of BBE programs, it is also useful to consider differences in these two customer groups in several areas/regards: how people perceive and use energy when at home and at work, motivations and incentives to save energy or change energy use behaviors (e.g., demand response), and nature and potential sources of influence over energy use behavior.

It's not surprising that very similar behaviors occur across residences (e.g., cooking, cleaning, lounging, sleeping, washing, etc.). The energy-related activities of employees in commercial businesses will include some common behaviors (e.g., use of office machines, desk computers or laptops, telephones, lighting, etc.), but will differ based on the business enterprise (e.g., manufacturing, restaurant/food service, retail, wholesale, warehouse operations, etc.), the energy requirements of the enterprise, and the business hours of operation. A significant difference between residential customers and commercial businesses is that residential customers typically pay for the energy that they use at home; employees do not pay for the energy that they use at work. Because

the business owner needs to supply energy to operate their enterprise, employees may not think about their energy use at work.

There are distinctions in the dynamics of some social processes between residences (and neighborhoods) and commercial businesses. Like neighbors, there may be close ties among employees in businesses extending beyond work and into social activities. The extent of interactions among employees has implications for the development of close relationships and group norms that maintain certain work behaviors and sanction others. Importantly, employee groups are more likely than neighborhoods to develop and enforce strong norms about acceptable behavior (Feldman 1984).

In addition to their direct influence through inducements and rewards, energy providers can indirectly influence residential neighborhoods and commercial businesses involvement by creating external forces for change in energy use whether through tax incentives for green residential and commercial business developments or green leases which carry expectations or requirements for renters and leases. Support for local and broader efforts can also spur the development of formal and informal residential and commercial associations that can leverage group norms to affect behavior changes in energy use.

Conclusions

Fundamental to behavior change is focusing on the behaviors (and associated values and beliefs) that are important to an individual or group. While rewards and incentives may initially attract some people to participate in a BBE, they may not be large enough or appealing to some people and are unlikely to hold the interest or participation of those for whom energy reduction is not as important as other things. BBE programs that are online-based programs are scalable to reach large numbers of customers, but they are limited in the extent to which they can engage customers. These types of BBE programs are also based on the marketing assumption that customers will share detailed personal information on themselves, their residences and their energy use for a small reward. The exchange is primarily an economic one and, overall, pushes information out to customers rather than engaging them. While this may work well for some customers, it will not work well for others.

Behavioral research suggests that energy providers need to get closer to their customers to understand what is important to them.   Online programs, colorful graphics and the promise of detailed energy use information may attract attention (an important first step), but may not sustain it or help utilities learn more about what matters to their customers. Online surveys, administered as part of a BBE, to assess what people value and think important may be seen as intrusive and invasive of privacy and may elicit socially desirable responses or no response.

Not all energy providers have embraced the online BBE programs. Providers in several states are experimenting with different program formats to eliminate a 'one size fits all' type of program. Some utilities are going beyond just offering the online program in reaching their customers. Massachusetts NSTAR[2] and Duke Energy[3] both have intensive in-person home programs and online programs which create opportunities for establishing a closer, trusting relationship with the customer, gathering important information about the customer's home context and energy use, completing the installation of basic energy saving measures (e.g., replacing incandescent lights with CFLs, and installing low-flow shower heads), and providing extensive, individualized recommendations for additional energy savings from the in-home audit. While the upfront effort is greater, the potential for immediate and sustained energy savings is substantial.

---

[2] http://www.nstar.com/residential/
[3] See for example Duke Energy program in Ohio: http://www.duke-energy.com/ohio/savings.asp

Moreover, through the in-home audit and customer engagement, the energy utilities can directly obtain commitment to an individualized course of action for energy reduction. Utility representatives and vendors involved with the programs can incorporate more of the factors that behavior theories indicate are important for sustained behavior change: provide relevant, highly specific information on energy use; determine what matters to the customer; develop a plan for energy savings (goal setting); install lights and water flow devices for immediate savings (immediate rewards make it easy for the customer to participate); if the customer agrees to other improvements, obtain commitment to a course of action (intention); identify funding assistance sources (e.g., NSTAR offers 0% loans over a 7-yr period); and in some cases, prepare a contract for the recommended work (commitment).

Kansas City Power and Light (KCPL) has an intensive community-type online program that also incorporates face-to-face customer interaction.[4] Their BBE program uses numerous communication and engagement tools (kiosks, mobile apps, social media, email communications, in-home and field demonstrations of advanced metering infrastructure (AMI) tools, and direct mail) to encourage customers to join the smart grid (AMI). In a pilot of the program, KCPL learned that customer adoption of a product (e.g., AMI) was not equivalent to engagement. As a result, KCPL used the information to establish mechanisms for information exchange with customers other than one-way communications and social comparisons. In essence, KCPL created a community that included options for interacting with one's peers (e.g., developing a community blog for asking questions and providing comments), identifying community leaders (top energy savers—who can opt out of being identified as energy saving leaders and providing recommendations to others), and for directly contacting experts (e.g., an expert forum). In a 100-home pilot, 10% energy savings were sustained over 2.5 years with 90% customer satisfaction. The pilot was replicated 2 years later showing 9% savings.

Going Forward

As noted above, several successful BBE programs rely on more than online interactions and one-way communications to engage customers and affect persistent behavior change. Energy providers should consider testing the efficacy of various formats for BBE programs by comparing in-person, on-line community, and more typical BBE online programs to determine which are most effective and scalable for specific customer segments.

Behavioral research shows the power of group norms in affecting and maintaining behavior. However, key to leveraging group norms is the existence of an intact group with which members identify. Although some BBE programs may claim that they are leveraging social norms via the communications sent about neighbors, at best, these BBE programs are providing social comparisons which may or may not be relevant to customers. Neighbors can be important influencers of behavior, but it is unrealistic to assume all neighborhoods and neighbors can be effective change agents. By utilizing what's known about the development and maintenance of group norms, utilities can create the environment in which neighborhood groups supportive of energy reduction can emerge.

For example, energy providers should consider sponsoring one or two-year demonstration projects in several neighborhoods within its customer population. A majority of the residences in the neighborhood would need to agree to participate in regularly-scheduled gatherings to discuss the progress of the energy efficiency demonstration. Energy providers would offer to install AMI and

---

[4] For example, see http://www.kcpl.com/save-energy-and-money/for-home for the KCPL CheckMe! Program and http://www.smartgridnews.com/artman/uploads/1/2012_June_7_Tendrill__Customer_deck.pdf

energy efficiency measures (e.g., alternative energy sources, energy-efficient windows) in the participating houses. Residents in participating houses would meet as a group with energy provider representatives to determine which energy efficiency measures the neighborhood should demonstrate. In return for the energy efficiency improvements, the participating houses would agree to set energy reduction goals and host regularly scheduled meetings to discuss their energy savings with their neighbors. Importantly, the energy provider would provide an energy expert for the meetings to answer questions, provide comparative information on energy savings for the demonstration houses and the rest of the neighborhood, and discuss challenges to energy use reduction and demand response.

This approach can be modified for commercial customers by selecting local business areas and encouraging the businesses within it to participate. In addition to the energy efficiency device installations, energy providers can also provide training for business owners on how to engage their employees in energy reduction.

A review of behavior theories relevant to efforts to change energy use behaviors (e.g., DSM) suggests that the efforts have been selective in how the theories have been applied. There is potential for the modest successes achieved in energy demand and use reduction to be larger and sustained over time. However, scaling even modest successes from local or pilot efforts to regional and larger programs will require more careful consideration of behavior theory elements and an understanding of the mechanisms that led to local successes (or failures). Only then can energy reduction programs be confident that what worked on a small scale is likely to generalize to a larger group or what adjustments are needed.

References

Abrahamse, W. and L. Steg. 2011. "Factors Related to Household Energy Use and Intention to Reduce It: The Role of Psychological and Socio-demographic Variables." *Human Ecology Review* 18 (1): 30-40.

Ajzen, I. 1991. "The Theory of Planned Behavior." *Organizational Behavior and Human Decision Processes* 50:179-211.

American Public Power Association. Revised September 2009. *"Public Power Utilities: Energy Efficiency Loan and Rebate Programs."* http://www.publicpower.org/files/PDFs/PPfinancialincentiveprograms509.pdf

Benfield, K. 2012. "Zoning reform strengthens Nashville's impressive sustainability efforts." http://switchboard.nrdc.org/blogs/Kbenfield/zoning_reform_strengthens_nash.html

Cialdini, RB & NJ Goldstein. (2004). "Social influence: Compliance and conformity" *Annual Review of Psychology* 55: 591-621

Davis, L.E., and J. C. Tyler. 1972. *Design of Jobs*. Harmondsworth, UK: Penguin Books.

DeYoung, R. 1993. "Changing behavior and making it stick: The conceptualization and management of conservation behavior." *Environment and Behavior* 25(4):485-505.

Egmond, C and R Bruel. "Nothing is as practical as a good theory, Analysis of theories and a tool for developing interventions to influence energy-related behavior." SenterNovem, Unpublished manuscript, September 2007.

Feldman, DC. 1984."The development and enforcement of group norms." *Academy of Management Review* 9(1):47-53.

Ferster, CB & BF Skinner. 1957. *Schedules of Reinforcement* New York: Appleton-Century-Crofts, 1957.

Gardner, G. T. and P. C. Stern. 2008. "The Short List: The Most Effective Actions Households Can Take to Curb Climate Change." *Environment Magazine* September/October. Updated December 15, 2009.

Kahneman, D. 2011. *Thinking, Fast and Slow* New Yrok: Farrar, Straus and Giroux.

Lally, P.; Van Jaarsveld C.H.; Potts H.; and Wardle, J. 2010. "How are habits formed: Modelling habit formation in the real world." *European Journal of Social Psychology* 40 (6),:998–1009.

Locke, E. A. and J. Bryan. 1969. "The Directing Function of Goals in Task Performance." *Organizational Behavior and Human Performance* 4:35-42.

Locke, E.A. and G.P. Latham. 2006. "New directions in goal-setting theory." *Current Directions in Psychological Science* 15 (15): 265-68.

Locke, E. A., K. N. Shaw, L. M. Saari and G. P. Latham. 1981. "Goal-setting and Task Performance: 1969-1980." *Psychological Bulletin* 90:125-52.

Lutzenhizer, L. 2009. "Behavioral Assumptions Underlying California Residential Sector Energy Efficiency Programs," Berkeley, Calif.: California Institute for Energy and Environment.

Melton, P. 2011. "Occupant engagement—Where design meets performance." Environmental Business News. http://www.buildinggreen.com/auth/article.cfm/2011/11/1/Occupant-Engagement-Where-Design-Meets-Performance. November 1.

New York City. 2011. "Mayor Bloomberg Announces First Ever Lease for Commercial Office Space that Contains Groundbreaking Language that Incentivizes Energy Efficiency." http://www.nyc.gov/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_release&catID=1194&doc_name=http%3A%2F%2Fwww.nyc.gov%2Fhtml%2Fom%2Fhtml%2F2011a%2Fpr109-11.html&cc=unused1978&rc=1194&ndi=1. New York, New York.

Nisbett, R. and L. Ross. 1980. *Human Inference: Strategies and Shortcomings of Social Judgment*. Prentice-Hall, Inc.: Englewood Cliffs, NJ.

Randazzo, K. V. and J. S. Peters. 2011. Reconsidering What We Measure: A White Paper. Residential Decision-making and Proposed Standard Questionnaire Items. Paper prepared for Southern California Edison and Pacific Gas & Electric. Study ID: SCE0305.

Ryan, RM, MF Lynch, M Vansteenkiste & EL Deci. 2011."Motivation and autonomy in counseling, psychotherapy, and behavior change: A look at theory and practice." *The Counseling Psychologist* 39(2):193-260.

State and Local Energy Efficiency Action Network. 2012. Evaluation, Measurement and Verification (EMV) of Residential Behavior-based Energy Efficiency Programs: Issues and Recommendations. Report by the State and Local Energy Efficiency Action Network.

Sullivan, M. 2009. Behavioral Assumptions Underlying Energy Efficiency Programs for Businesses. Berkeley, CA: California Institute for Energy and Environment.

Taylor, F. W. 1911. *The Principles of Scientific Management*. New York: Harper Bros.

Triandis, H. C. 1977. *Interpersonal behavior*. New York: Wiley.

"Triandis' Theory of Interpersonal Behaviour." http://www.cres.gr/behave/pdf/Triandis_theory.pdf

Tversky, A. and D. Kahneman. 1974. "Judgment Under Uncertainty: Heuristics and Biases." *Science* 185: 1124-31.

U.S. Department of Energy. 2014. Tax Credits, Rebates, & Savings. http://energy.gov/savings Accessed 4Mar2014.

Vroom, V. H. 1964. *Work and Motivation*. New York: Wiley.

Wakefield, MA, B Loken & RC Hornik. 2010. "Use of mass media campaigns to change health behavior." *The Lancet* 376 (9748): 1261-71.

Wagner, J. A., III and J. R. Hollenbeck. 1992. *Management of Organizational Behavior*. Englewood Cliffs, New Jersey: Prentice Hall.

Wood, ND, J Labrecque & P Lally. 2011. "How do habits guide behavior? Perceived and actual triggers of habits in daily life." *Journal of Experimental Social Psychology* 48: 492-8.

Wood, R., A. Mento and E. Locke. 1987. "Task Complexity as a Moderator of Goal Effects." *Journal of Applied Psychology* 17:416-25.