Pursuing Energy-Efficient Behavior in a Regulatory Environment: Motivating Policymakers, Program Administrators, and Program Implementers

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Executive Summary

This white paper examines how policymakers, program administrators, and program implementers can be motivated to pursue behavioral change in a regulatory environment. For the purposes of this report, behavior change is defined rather broadly, encompassing both behaviors associated with the purchase and installation of energy efficiency technologies as well as behaviors, decisions, and actions that might be thought of as more independent of technology. These include energy use habits, lifestyle choices, and consumption patterns. The insights and lessons discussed in this paper are drawn from a wide variety of sources including interviews with representatives from the energy and utility communities, and program documentation for energy-related programs and projects. We also researched information on non-energy-related programs that operate within a similar environment, and publications that explore the effective strategies of high-performance government organizations.

The three primary goals of this report include: (1) identifying common perceptions of behavior change strategies; (2) identifying contexts in which program administrators, implementers, and others have been or are likely to be motivated to pursue behavior change as a means of reducing energy consumption; and (3) specifying effective policy options to further motivate policymakers, program administrators, and program implementers to pursue behavior change as a means of enhancing energy and carbon savings.

The research clearly indicates that a variety of factors have worked to deter program managers and policymakers from pursuing many behavior-change strategies as a means of achieving cost-effective reductions in energy consumption. We began this research effort with the assumption that policymakers and others might be motivated by an assortment of current factors, including: (1) the rising cost of energy, (2) concerns about improving customer service, (3) the development and application of new information and communication technologies that can reshape traditional utility infrastructures and enable households to better manage their energy consumption, and (4) efforts to meet new climate change imperatives. Yet, results from our survey indicate that there are important barriers to pursuing behavior change strategies and that the barriers continue to outweigh existing incentives.

Among the most significant barriers to using behavior-based approaches include concerns regarding (1) the lack of sufficient research on the effectiveness and persistence of behavior change strategies in terms of energy savings, (2) the impact of established measurement and evaluation methodologies that undercount the energy savings from behavior, and (3) current rigid regulations that hinder experimentation and innovation.

Importantly, however, the evidence suggests that while the current pool of potential, behavior-based energy savings is frequently ignored, it is a large resource that is increasingly accessible and of significant importance in meeting both short- and long-term energy and climate change goals. Moreover, behavior change strategies are increasingly recognized as offering a valuable means of accelerating the pace of energy savings, increasing the overall level of savings potential, and expanding the longevity and sustainability of energy savings. In addition, behavior change strategies could also help close the expansive energy efficiency gap that exists between the potential and actual energy savings, as well as the gap between favorable consumer

attitudes and less favorable behaviors. Given the scale of potential savings offered by behavior change strategies, it isn't surprising that an overwhelming majority of the energy experts interviewed for this paper expressed concern that too few behavior change strategies were currently being pursued. The solution will require a reassessment of traditional approaches to energy efficiency and energy conservation so as to remove existing biases and disincentives, to increase our knowledge and our confidence regarding the effectiveness of specific behavior change strategies, and to expand our capacity and expertise to execute and evaluate effective approaches.

Given the research performed for this paper, we have formulated four primary recommendations. First, we recommend that funding and support for research and experimentation in behavior change strategies be increased so as to expand the base of reliable knowledge regarding the most effective approaches for achieving behavior-based energy savings. Second, we recommend that current schemes for program implementation and energy savings attribution be adjusted to incorporate mechanisms that facilitate the recognition of energy savings from behavior change strategies. Third, we recommend that existing measurement and accountability practices be adjusted to allow program managers more leeway to incorporate behavior change strategies and apply qualitative measures of customer satisfaction. Finally, we recommend that the scope of understanding regarding the purview of utility regulators be viewed more broadly so as to enable greater investment in a broader range of cost-effective programs — particularly behavior change strategies — and to encourage more social scientists to join the staff at all levels. A more detailed discussion of these recommendations can be found in the conclusions section of this report.

1. The Benefits of Pursuing Behavior Change Strategies

Among the benefits of behavior change strategies and research is the promise that it holds for explaining, understanding, and addressing the two most important gaps that persist in maximizing energy efficiency and reducing energy consumption. Behavior-based programs can help identify solutions for closing: (1) the energy efficiency gap (the gap between potential, cost-effective, energy efficiency investments and those investments actually made); and (2) the attitude-behavior gap (the gap between favorable attitudes toward energy efficiency and less favorable behaviors).

For approximately 30 years, researchers have attempted to identify the causes behind the energy efficiency gap (primarily from an economic perspective), attributing the gap to various market barriers, transaction costs, and consumer attitudes and preferences (Sanstad et al. 2006; Stern and Aronson 1984). In fact, research on this topic suggests that the unrealized, cost-effective, energy efficiency savings associated with this gap may be on the order of 25% of current energy demands (Laitner et al. 2009; Gardner and Stern 2008). Similarly, among social scientists there has been a parallel effort to explain the gap between favorable environmental attitudes and less favorable behaviors (Dunlap et al. 1983; Murch 1974). For example, recent Gallup poll research indicates that 78% of Americans say that individuals should help reduce global warming by spending thousands of dollars to make their homes energy efficient (Carroll 2007). Moreover, 77% report that they personally worry (either a fair amount or a great deal) about the availability and affordability of energy. Despite this large and growing concern over global warming and the affordability of energy, a minority of Americans are taking action. According to a 2008 Gallup poll that asked about changes in shopping and living habits over the past 5 years, only 10% of Americans reported having made efforts to conserve energy, 7% reported using energy-saving light bulbs, 4% reported upgrading to energy-saving appliances, and a mere 2% reported taking actions to make their home more energy efficient (Jones 2008).

Indeed, a targeted study of U.S. residential sector energy consumption and potential savings (Gardner and Stern 2008) suggests that more than 25% of residential energy consumption (a total of more than 5.4 quads) could be eliminated using readily available technologies. Nevertheless, people aren't taking advantage of the potential for real energy savings. In fact, the survey results cited above indicate a gap of 76% between the 78% who say they should be making their homes more energy efficient and the 2% who have done anything about it during the past 5 years.

Energy experts suggest that the gap between consumer attitudes and behaviors can be bridged (at least in part) through the expansion of efforts to understand and address the choices and behaviors associated with energy consumption, energy efficiency, and energy conservation in the United States. In order to narrow these gaps, energy experts suggest that programs and policies need to look beyond traditional economic frameworks and instead acknowledge that: (1) not only do people operate within conditions of *bounded* rationality, (2) they also behave in predictably *irrational* ways (Ariely 2008), and (3) behaviors that may not be considered to be *economically* rational may still be considered rational from other vantage points (Ehrhardt-Martinez et al. 2008.) In other words, behavior change strategies and policies that reflect the diversity and range of human behavior are among the most promising avenues for bridging both gaps while also expanding and accelerating energy savings.

But how can we shift gears and pay more attention to the human dimensions (social and behavioral) of energy and energy efficiency within a regulatory environment? While recent studies suggest that energy savings could be greatly enhanced and potentially accelerated through the application of social and behavioral considerations (Gardner and Stern 2008; Laitner et al. 2009), these savings are unlikely to be achieved without the right motivation. This white paper is focused on identifying motivating contexts for pursuing behavior change strategies in a regulatory environment. The three primary goals of this report include: (1) identifying common perceptions of behavior change strategies; (2) identifying contexts in which program administrators, implementers, and others have been or are likely to be motivated to pursue behavior change as a means of reducing energy consumption; and (3) specifying effective policy options to further motivate policymakers, program administrators, and program implementers to pursue behavior change as a means of enhancing energy and carbon savings

The following section provides a description and discussion of existing perceptions and practices with regard to behavior change strategies. An essential part of this discussion is focused on clarifying what energy experts typically mean when referring to the concept of behavior change strategies and identifying the degree to which these strategies are currently supported and implemented. The discussion in Section 2 draws on information collected from a non-random sample of energy experts, including 20 in-depth interviews and 123 online surveys. (More information about the research methodologies employed can be found in Appendix A.)

Section 3 offers a conceptual framework for integrating social and behavioral concerns into long-standing, technology-based efforts to effect change. The framework borrows from the international development community and the efforts of U.S. Agency for International Development (USAID) to integrate the human and social dimensions of economic development into programs and policies that had been perceived as the exclusive purview of engineers, bureaucrats, and economists. Section 3 discusses the ways in which the new USAID framework incorporates the human dimensions of change and discusses how the adoption of a similar conceptual framework might facilitate the pursuit of behavior change strategies among energy professionals in the U.S.

Section 4 draws from the survey research to identify existing incentives and disincentives and also to present information on possible alternative approaches for constructing suitable motivational structures. Section 5 focuses in on organizational barriers to the pursuit of behavior change strategies. The discussion utilizes the well-respected work of David Osborne (a fellow with the National Academy of Public Administration and a former advisor to Vice President Gore) to discuss specific ways of creating adequate space for innovation and experimentation and empowering people to pursue good ideas, to innovate, to invest, and to take appropriate risks with the goal of increasing overall effectiveness.

Section 6 acknowledges the potential constraints to pursuing behavior change strategies imposed by narrow definitions of regulatory purviews. It provides some historical evidence regarding the malleability of the scope of activities that are justifiably within the purview of utility regulators, and it encourages regulators to rethink their public responsibilities in the context of new climate imperatives.

Section 7 identifies, assesses, and discusses three behavior change strategies that exemplify some of the points suggested in this report. Each was selected to illustrate the potential for success associated with behavioral program interventions as well as to show the ways in which the social sciences can help to inform and improve the effectiveness of energy efficiency and energy conservation strategies.

The final section of the paper provides a brief summary of the current perceptions of (or "barriers to") behavior change strategies, context-based incentives and disincentives, and recommendations for program and policy-level changes that broaden the opportunities of program and policy staff to pursue behavior change strategies.

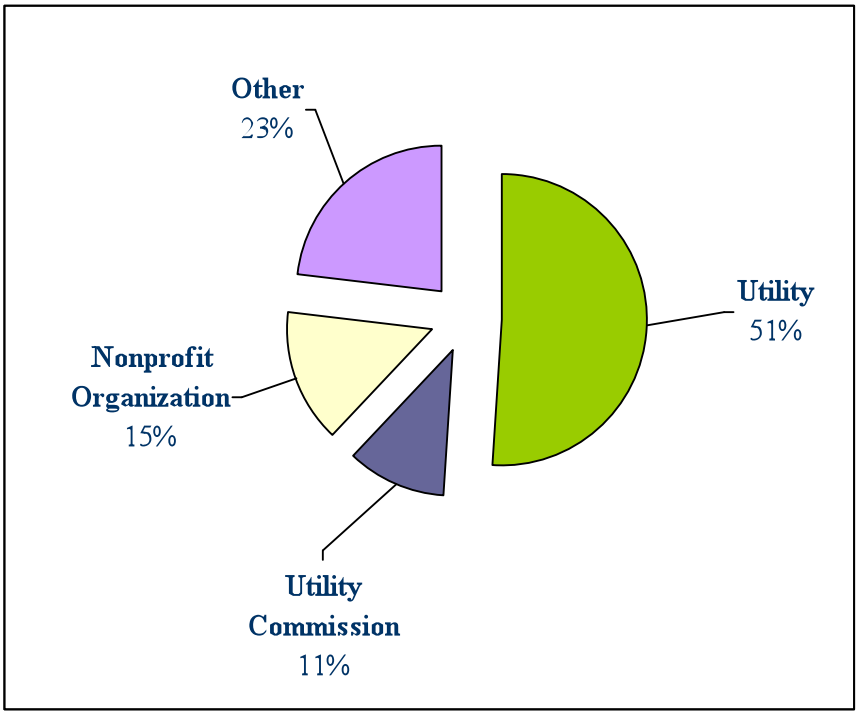
2. Current Perceptions of Behavior Change Strategies

Recent studies suggest that energy savings could be greatly enhanced and potentially accelerated through the application of programs and policies that successfully identify and address social and behavioral considerations. In fact, the incorporation of such insights could result in behavior-related energy savings of 25 to 30% in the residential sector alone (Gardner and Stern 2008; Laitner et al. 2009). Nevertheless, these savings are unlikely to be achieved without the right mix of policies and programs that both recognize and successfully tap into behavior-related energy savings and without program structures that can successfully motivate staff to integrate behavior change strategies.

2.1 What Are Behavior Change Strategies or Behavior-Oriented Approaches to Energy Savings?

The ideas presented in this paper have primarily been distilled from three data sources: (1) in-depth interviews with twenty, well-seasoned energy efficiency experts with an average of 20-30 years working on energy and efficiency issues; (2) a discussion of the topic issues with energy professionals attending the 2008 ACEEE Summer Study; and (3) an online survey of 123 energy professionals. Figure 1 shows the affiliation of the respondents from both sets of respondents. See Appendix A for more details.

Figure 1: Survey Respondent Affiliation



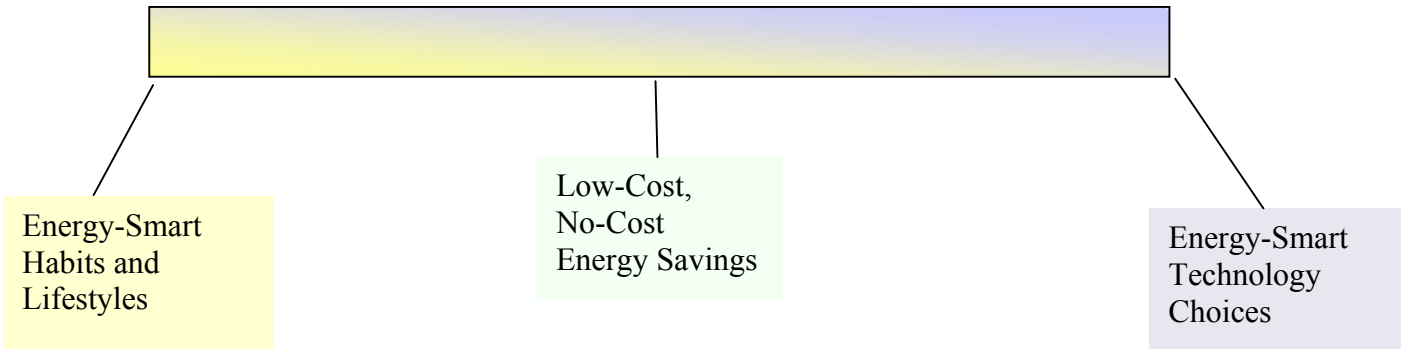
Source: ACEEE online survey of energy professionals

The results from our surveys indicate that energy professionals are increasingly interested in using behavior change strategies to reduce energy consumption. However, large discrepancies abound concerning an agreed-upon definition and defined scope of activities that should be included under the rubric of behavior change strategies. Among the more narrowly defined perspectives, some economic policy analysts view behavior change strategies as nothing more than a means of supplementing the deployment of smart technologies. From this vantage point, behavior change strategies are best characterized as niche strategies that may or may not facilitate the deployment of smart technologies. Other researchers provide a much broader perspective, suggesting that behavior change strategies include a wide range of activities and are the potential source of significant energy savings (Laitner et al. 2009; Ehrhardt-Martinez et al. 2009; Ehrhardt-Martinez 2008). In short, the narrow, technology-centric perspective of behavior is more likely to characterize behavior change strategies as an add-on type of program, whereas the broader, human dimensions approach is more likely to recognize the core role that behavior needs to play in order to realize maximum energy savings. Not surprisingly, those who subscribe to the latter view often argue for a more balanced approach that recognizes the complex inter-relationship that exists among behavior, society, and technology.

For the past twenty years, the technology-centric perspective has predominated among energy professionals and policymakers. However, in a recent effort to quantify the scope of potential behavior-related energy savings, Laitner et al. (2009) argue that while "behavior-oriented programs are a necessary complement to technology and/or incentive based programs," they are also much more. In their paper, Laitner et al. explore the multiple ways in which individual and household behavior can both enable and enhance energy savings in the residential sector. Their

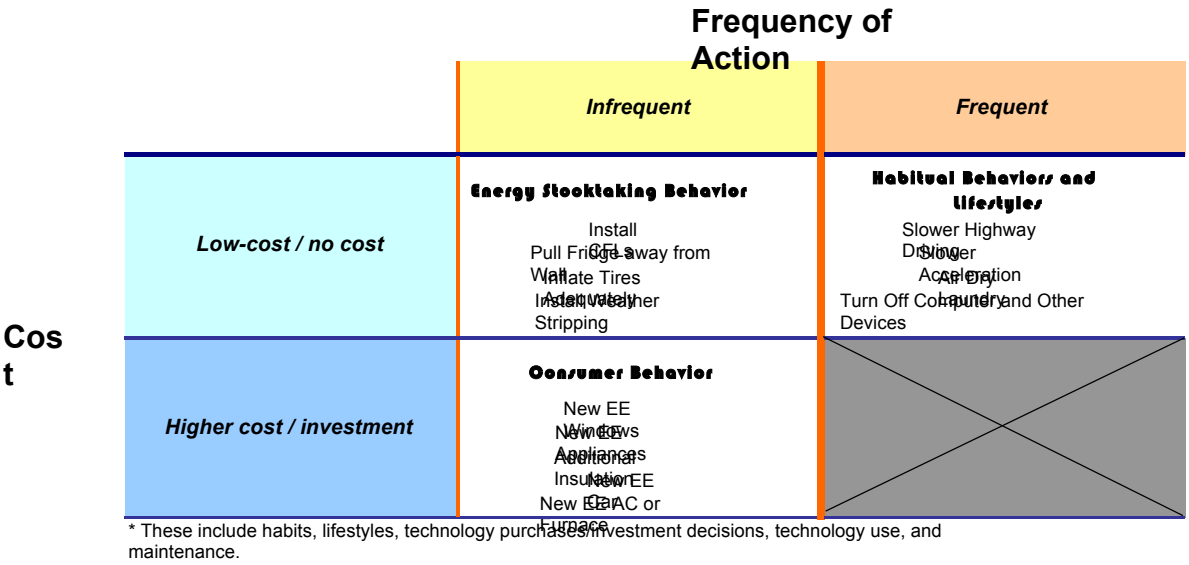
conceptualization includes a description of a very broad range of behavior-related activities including both traditional and more recent perspectives. The authors illustrate this range of activities through the development of a "behavior energy response continuum." On one end of the continuum, behavior change strategies include energy-smart technology choices, while on the other, they include energy-smart habits and lifestyles. The middle of the continuum includes a variety of infrequent, low-cost and no-cost behaviors including weather-stripping and caulking and insulating ducts or ensuring adequate space between the refrigerator and the wall (see Figure 2).

Figure 2: The Behavior Energy Response Continuum



Another, albeit related, way of conceptualizing energy-related behaviors involves measures of associated costs as well as the frequency of the behavior in question. Laitner et al. (2009) use this conceptualization scheme to create a typology in which the combination of cost and frequency determine the classification of the behavior and suggest three distinct program strategies as shown in Figure 3 below.

Figure 3: Categories of Residential Energy Impact

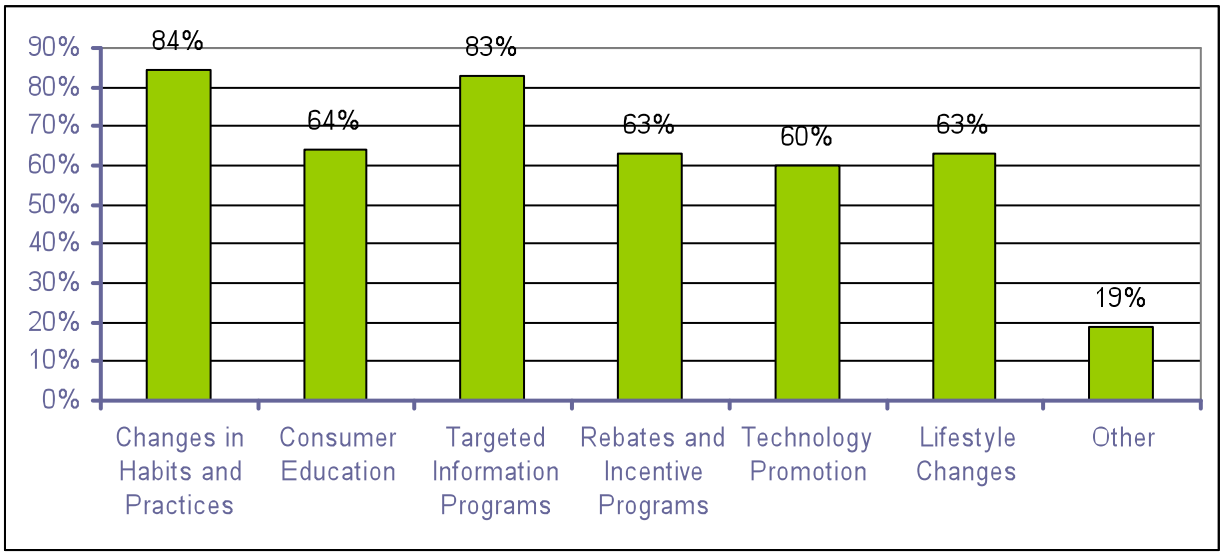


* These include habits, lifestyles, technology purchases/investment decisions, technology use, and maintenance.

Given the range of potential energy saving behaviors, it is hardly surprising that the survey results indicate that today's energy professionals don't share a common definition or conceptualization of behavior change strategies. Instead, the conceptual understanding of energy professionals ranges from a more traditional focus on consumer information programs and technology adoption to a broader vision that encompasses habits, lifestyles, and issues of energy sustainability. Interestingly, however, data from our online survey of 123 professionals indicate that the *largest* proportions of respondents conceptualized behavior change strategies as including both those that target changes in everyday energy use habits or practices (84%), and those that provide consumers with targeted information about their specific energy consumption practices (83%).

Despite high levels of agreement on the two components of behavior change described above, our research also reveals significant *disagreement* with regard to a number of other conceptual elements. Less than two-thirds of respondents supported the notion that behavior change included consumer education, rebates and incentive programs, technology promotion, or lifestyle changes. In short, the survey results (although not representative of the larger population) support the notion that the concept of behavior change means different things to different people.

Figure 4: Components of Behavior Change Strategies



Source: ACEEE online survey of energy professionals

The survey also reveals some potential regional and occupational distinctions. Interestingly, when compared with respondents from New York (and a few other areas of the country), respondents from California were more likely to include rebate programs in their definition of behavior change strategies. Also of note, respondents employed by utilities tended to have a more inclusive definition of behavior as opposed to respondents from public utility commissions.

Information gathered through the in-depth interviews revealed that those energy professionals who were more focused on decision making were also more likely to be concerned with technology adoption and the purchase of more energy-efficient products and technologies. The in-depth interviews revealed that respondents who subscribed to this approach also tended to envision behavior change strategies as being primarily concerned with the best means of influencing the decision-making process of individuals and organizations with the ultimate goal of reducing energy consumption primarily through the purchase or adoption of more energy-efficient technologies.

Energy practitioners who conceptualized behavior primarily in terms of everyday practices, lifestyle choices, and habits were more apt to be concerned with patterns of behavior, such as turning off lights, taking shorter showers, using low-energy cooking alternatives, turning up/down the thermostat, and washing in cold water.

Finally, some people working both in the nonprofit world and managing utility programs described behavioral approaches in the broadest terms, encompassing not only the behaviors of energy consumers but also the behavior of trade allies, contractors, salespeople, specifiers, designers, and other market actors. Notably, a minority of the respondents indicated that they would also include political behaviors and investment decisions in the mix.

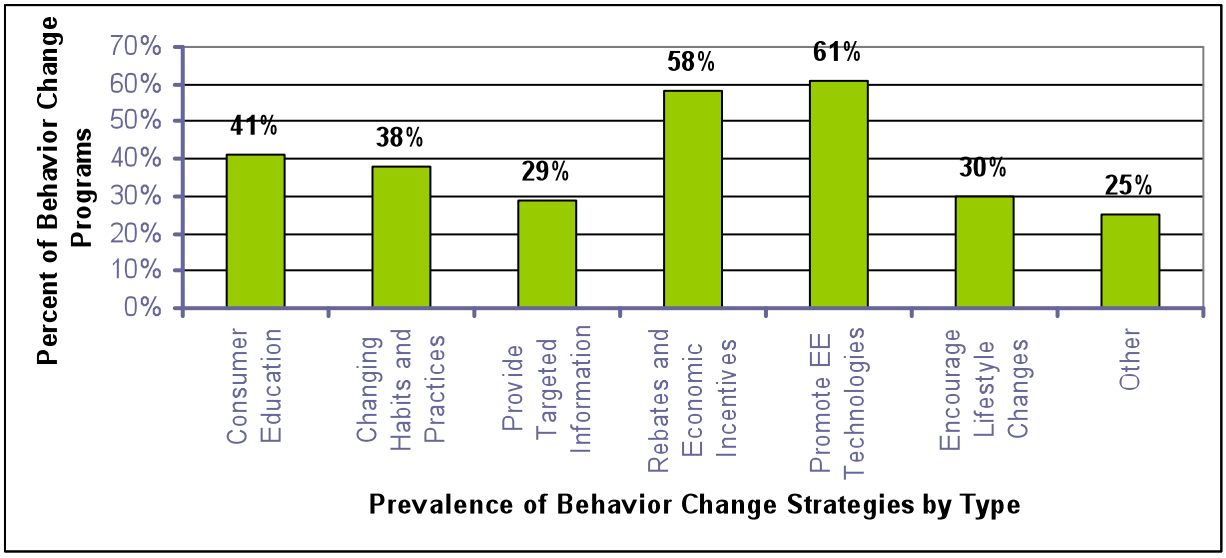
For nearly all respondents, behavior change strategies were limited to efforts to change energy consumption patterns through voluntary measures that don't involve sacrifice. Nevertheless, a few respondents consciously argued for the need to address both sufficiency and efficiency, disputing the assumption that actions involving sacrifice should be excluded.[1] So while the predominant conceptualization was primarily concerned with using less energy to meet the same level of energy service demands, an alternative conceptualization suggested the need to reduce energy service demands. Interestingly, younger people were more likely to include conservation and concepts of sufficiency in their conceptualizations of behavior than were older people with more experience in this field. Some really old timers, perhaps a continuing minority, expressed the notion that everything can be connected to behavior in one way or another (Keating and Flynn 1984).

2.2 What Are the Most Typical Behavior Change Strategies?

In order to assess the prevalence of different types of behavior change strategies, survey respondents were asked to estimate the percentage of their organization's programs that involved the application of specific behavior change strategies.[2] The results are shown in Figure 5. The most commonly reported behavior change strategy involved specific efforts to encourage the purchase of more energy-efficient products or equipment. Respondents indicated that of those programs that include a behavior change element, roughly 61% include efforts to encourage the purchase of more energy-efficient products or equipment. Approximately 58% of programs include efforts to provide consumers with rebates or other economic incentives (such as special rate designs, cash incentives based on usage reduction, etc.) so as to reduce energy consumption and/or increase energy efficiency. Efforts to provide consumer education were estimated to be included in roughly 41% of programs. These efforts focus on educating consumers about general energy consumption patterns, energy efficiency, or other general aspects of energy use. Another 38% of programs include efforts to change everyday energy use habits and practices, while 30% of programs were reported to include efforts to provide consumers with information about their specific energy consumption practices or encourage lifestyle changes.

[1] See Moezzi and Diamond (2005) for a detailed set of arguments for including sufficiency.
[2] The exact question wording can be found in the online survey schedule (Appendix B), item 7.

Figure 5: The Prevalence of Different Types of Behavior Change Strategies



Source: ACEEE online survey of energy professionals

According to both the survey data and related studies (see, for example, Lutzenhiser 2009) most current behavior change strategies are built on the premise that individuals will change their behavior if and when they have the right information and financial incentives. Often the information component is focused on the economic and/or environmental implications of consumer choices. The underlying assumption is that if people only knew how much money or energy they were wasting and had information as to the availability of cost-effective alternatives, they would change their behavior so as to fix the problem, saving both money and energy. In addition to providing useful information, many programs also commonly offer rebates on the purchase of more energy-efficient technologies or other financial incentives. Rebates are used as both an incentive to encourage the purchase of the more energy-efficient models and brands as well as a means of shortening the payback period or the length of time needed for the value of the cumulative energy savings to match the difference in cost between the more energy-efficient and the less energy-efficient device. The availability of rebates also draws attention to product categories that may have been overlooked.

While the use of information, education, and rebates has a relatively long history as a means of addressing the behavioral dimensions of energy consumption, two other approaches have been receiving increased attention — the use of feedback devices and the use of social marketing mechanisms. The use of sophisticated and high-tech feedback mechanisms offers energy consumers both detailed and sometimes contextualized information that allows consumers to monitor, evaluate, and adjust their own levels of energy consumption. And the use of marketing and social marketing campaigns provides a means of motivating energy consumers to reduce their level of energy consumption by shaping and reshaping consumer attitudes, values, and culture as they relate to energy consumption.

2.2.1 Feedback mechanisms: A combination of factors has resulted in an expanded interest in the use of feedback mechanisms as a means of encouraging reductions in energy use in the residential sector. Among these factors is the proliferation of low-cost, high-tech sensors,

electronics, and devices that provide the means by which detailed information can more easily be gathered regarding energy use within the household and then communicated to the energy user. Without these devices, residential sector energy consumption remains largely invisible to household consumers, making energy management much more difficult. With these devices, household consumers can gain access to more detailed information concerning their unique energy use practices including the amount of energy consumed, seasonal energy use, and other variations in household energy use patterns, plus the energy implications of their unique combination of energy service demands. The use of feedback mechanisms has been shown to reduce energy consumption by 5 to 15% (Darby 2006).

Feedback mechanisms are also receiving increased attention due to their ability to communicate energy consumption norms among residential consumers. In this case, research from the field of social psychology is combined with energy consumption data to formulate normative messages that have been shown to be effective in reshaping energy consumption patterns (Darby 2006; EPRI 2009; Schultz et al. 2007; Nolan et al. 2008). More specifically, this approach uses information regarding the energy consumption trends within a specific community to formulate and share specific, normative messages regarding "appropriate" levels of energy consumption. This information provides households with an important point of comparison against which they can evaluate their own consumption patterns, ultimately leading to lower levels of energy consumption (Nolan et al. 2008).

2.2.2. Social marketing: Social marketing and community-based social marketing are specific approaches that have been used to build on existing social networks as a means of diffusing new, energy-efficient technologies and of establishing new energy consumption norms. This kind of marketing applies marketing technologies developed in the commercial sector to solve *social* problems including health-related issues and environmental issues such as unsustainable energy consumption and greenhouse gas emissions. The ultimate goal is always behavior change.

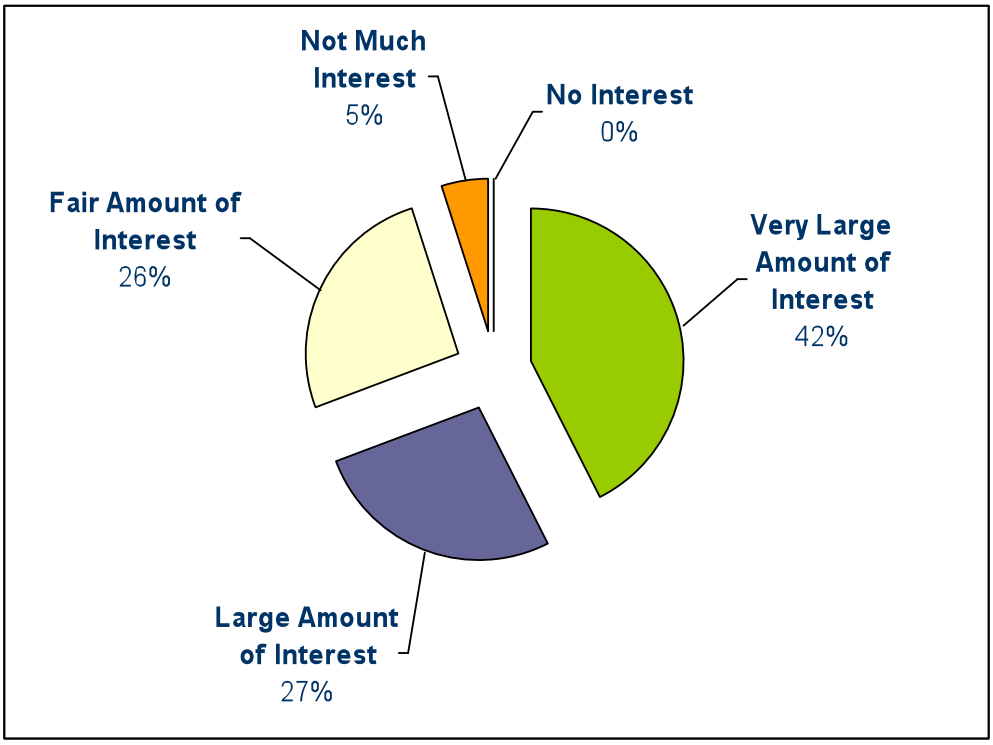
The use of social marketing and social networks can increase the credibility of energy-related information, and provide non-financial means of motivating residential energy users to change their behaviors so as to reduce the amount of energy they consume. A variety of organizations including utilities, nonprofits, and government agencies have incorporated social marketing strategies into their energy programs as a means of motivating energy consumers to reduce energy consumption (Reed 2007; University of Toronto Sustainability Office 2006; McKenzie-Mohr and Smith 1999).

2.3 Support and Constraints for Pursuing Behavior Change Strategies

There has clearly been a resurgence of interest in behavior change strategies within the energy community during the last several years. The online survey results (Figure 6) indicate that more than two-thirds of respondents (68%) reported that there is either a large or very large amount of interest within their organization in promoting or administering programs that pursue behavior change as a means of reducing energy consumption. Another 25% of respondents reported a fair amount of interest. The level of interest among respondents employed by public utility commissions was notably higher, with 83% reporting a large or very large amount of interest.

Moreover, the in-depth interviews revealed that a wide variety of organizations and utilities are currently piloting programs that use behavior change strategies.

Figure 6: Amount of Interest within Your Organization to Promote Behavior Change Strategies



Source: ACEEE online survey of energy professionals

While the interest in behavior change strategies is currently strong among energy practitioners, several impediments have served to forestall efforts to design and implement programs that reflect this growing interest. These include: 1) a lack of sufficient research and evaluation mechanisms, 2) a persistent technology bias and lack of sufficient funding to pursue behavior change strategies, 3) concerns over the persistence of energy savings from behavior change strategies, 4) constraints associated with existing measurement methodologies, and 5) the limited number of social scientists employed within regulatory agencies and other organizations operating in the energy research and policy arenas.

According to survey respondents, the primary constraint to the pursuit of behavior change strategies is a lack of a sufficient research and adequate evaluation mechanisms to reliably test and quantify the effectiveness of different behavior change strategies in today's world, given the current mix of worldviews, technologies, education levels, demographic patterns, and income ranges.[3] Such a research and evaluation effort is essential in order to reasonably assess the importance of different program design elements in determining the corresponding levels of energy savings, and to determine the ways in which households and individuals are likely to

[3] This was identified as the primary constraint for the overall sample as well as for respondents from California.

respond differently to specific behavior change strategies. In short, better research and evaluation tools are needed. Among these, a well-designed and coordinated research effort would go a long way toward providing much needed documentation of the attainable energy savings associated with behavior change strategies. Nearly 40% of respondents indicated that more research and evaluation are needed in order to quantify behavior-related energy savings, and nearly 70% included it among the top two constraints.

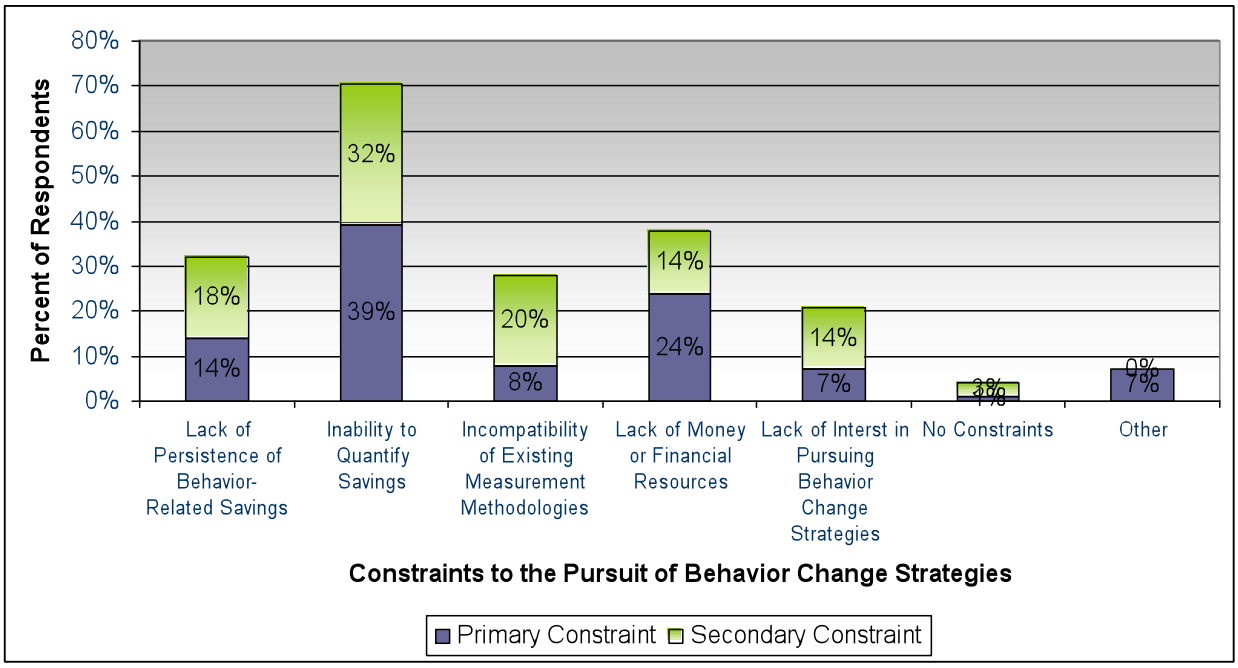
While behavior-related research funding was available during the 1970s and early 1980s, little effort has been made during the last 20-25 years to investigate the ways in which ongoing academic research on behavior change could be applied to the problem of energy/carbon reduction. As a result, many of the current behavior change strategies are either based on old models and assumptions regarding human and organizational behavior, were built on research performed in the 1970s and 1980s, or are based on new but untested approaches. While a certain proportion of past research undoubtedly transcends the passage of time, a new wave of coordinated social and behavioral research is needed in order to account for the many cultural, social, and technological changes that have reshaped energy use practices and patterns during the intervening decades. Without this type of research, program administrators and implementers are likely to be more hesitant to support strategies focused on behavioral change, and the energy savings associated with existing projects are likely to be lower than they might otherwise be.

A second barrier is the somewhat long-lived technology bias that favors energy savings associated with the adoption of new technologies above other means of energy savings. In addition, a technology bias is generally associated with the perception that technology-based savings are more persistent and reliable. Importantly, this predisposition toward technology as the preferred means of achieving energy savings has become institutionalized via evaluation criteria that attribute energy savings to the installation of new equipment without giving adequate recognition to the ways in which behavior enables, undermines, or maximizes those same savings.

A bias toward technological solutions and technology-based evaluation criteria has often meant that funding for behavior change strategies is harder to find. Approximately one-quarter of all respondents identified a lack of financial resources as the primary constraint to the pursuit of behavior change (see Figure 7). Concerns over the lack of persistence of behavior-related energy savings were also notable — 31% of respondents identified this issue among their top two concerns.[4] However, respondents from California were *very* concerned with the constraining impact of existing measurement methodologies. Roughly 26% of California respondents identified this as the second most important constraint to the pursuit of behavior change.

[4] Only 21% of California respondents identified persistence concerns as among the top two constraints for pursuing behavior change strategies.

Figure 7: Constraints to the Pursuit of Behavior Change Strategies



Source: ACEEE online survey of energy professionals

Finally, results from the in-depth interviews of energy experts also suggest that the demand for behavior programs is likely to be dampened by the limited number of social scientists employed within regulatory agencies and other organizations operating in the energy research and policy arenas. Without adequate representation, particularly in upper level positions and positions of influence, insights from the social science community are less likely to gain sway or be incorporated into policies and programs designed to reduce energy consumption.

2.4 The Prevalence and Contributions of Behavior Change Strategies and Programs

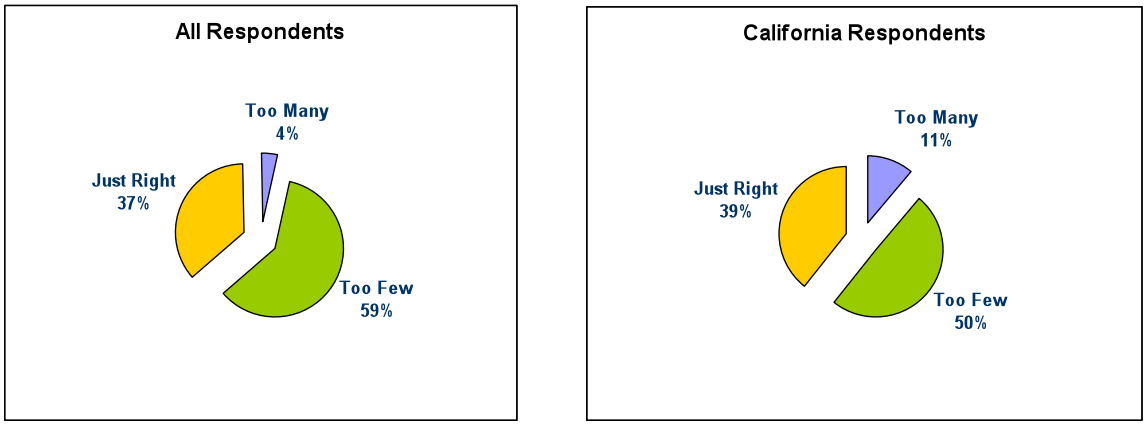
The *prevalence* of behavior change strategies is difficult to ascertain given that individual conceptualizations of what should and shouldn't be considered behavior change strategies vary considerably. However, if the broadest definition of behavior change strategies and programs is used, then behavioral approaches are typically viewed as both wide-spread and under-acknowledged contributors to much of the energy savings that have been achieved historically. Regardless, both the literature and nearly all (> 90%) of the 20 energy experts who we interviewed stated that there are currently too few behavior change strategies being employed and suggested that more are needed.

Results from the online survey provide some indication of the current prevalence of behavior change programs. In the survey, approximately 42% of respondents reported that all, or nearly all, of their programs and policies pursued some type of behavior change. This number was significantly higher in California where 53% of respondents reported that all or nearly all of their programs and policies pursued behavior change. The corresponding number for respondents in New York State was 28%. Given the large proportion of respondents from California reporting a

more widespread integration of behavioral considerations, California respondents were comparatively less likely to perceive the need for additional programs. In California, nearly 50% of respondents reported that there are currently too few programs pursuing behavior change compared to 65% in other parts of the country (see Figure 8). [5] Regardless, California respondents were not very likely to report an overabundance of behavior programs. Only 11% reported that there were too many behavior programs, while 39% reported that there was roughly the right number of behavior programs.

Perceptions of the *effectiveness* of behavior change strategies also vary significantly. Many energy professionals identify behavior change strategies as an essential component of any effort to provide a comprehensive and integrated means of: (1) achieving deeper levels of energy savings, (2) accelerating the pace of energy savings, and (3) achieving lasting change and reducing the likelihood of rebound.[6] Nevertheless, as mentioned earlier, energy savings from behavior change strategies are also commonly perceived as more difficult to document, which sometimes results in the misperception that these programs are somehow ineffective. As such, there is a danger that the desire for straightforward measures of direct effects could preclude the implementation of effective behavior change strategies that require more nuanced measures of both direct and indirect effects.

Figure 8: Preponderance of Programs that Pursue Behavior Change Strategies



Energy professionals interviewed for this report indicated that behavior change strategies were potentially highly effective and that, as with any type of program or intervention, their effectiveness was largely a function of the quality of the program's design and implementation. Some of the program design elements that were identified as important include moving beyond the standard "information" oriented strategies of the past and toward the use of more sophisticated and multifaceted approaches that are able to identify and address the issues that

[5] The combined results for all respondents indicate that 59% thought there were too few programs pursuing behavior change.

[6] The rebound effect refers to the increase in energy service demand that sometimes accompanies an increase in energy efficiency. In terms of energy consumption, rebound can reduce or dilute expected efficiency gains associated with more efficient technologies and practices when people choose to use the product for longer periods of time or to use more energy-consuming products.

consumers find compelling. Interestingly, while most of the in-depth interviews revealed favorable attitudes toward the effectiveness of behavior change strategies, there were also a few cases in which respondents weren't as confident and suggested instead that behavior change strategies were as yet unproven.

Perhaps the most commonly held reservation of respondents regarding the effectiveness of behavior change strategies concerns the current difficulties of quantifying behavior-related savings and the persistence of savings over time. Ongoing research will be needed to develop new evaluation methods to measure behavior-related savings as well as evaluate the contexts and circumstances in which these savings are most likely to persist over time.

In circumstances where the impact of behavior programs is measured as the part of the variation in energy use that can't be explained as a result of new widget sales (i.e., technology), the actual impact of behavior is destined to be perpetually undervalued. As such, an important first step to recognizing the full range of behavior-related energy savings requires that energy practitioners start with the recognition that all technology-based programs include some behavior components — whether in terms of technology adoption, technology use, or some other aspect of the human/technology continuum. Unfortunately, it is currently common practice to attribute 100% of the energy savings achieved by technology-oriented programs and policies to hardware measures. As a result, the social and behavioral dimensions of these energy savings continue to be under-recognized, and the potential contributions of social science insights to reducing existing levels of energy consumption continue to be undervalued or ignored. This practice perpetuates a persistent and pervasive technology bias.[7]

Finally, respondents also commented on the strengths and benefits of pursuing behavior change strategies. According to data collected from the online survey, respondents were most excited by the untapped energy savings potential associated with behavior change approaches. In addition, utilities and public utility commissions were also quick to recognize the potential benefit to consumers of providing low-cost or no-cost options for reducing their energy costs. Finally, respondents also expressed interest in the contribution that behavior change programs might make in accelerating the pace of change in energy efficiency. The following discussion explores the problems and weaknesses in more depth, followed by a discussion that explores the benefits and strengths in more detail.

2.4.1 Perceived problems and weaknesses: Behavior change strategies have certain perceived problems and weaknesses. When asked, energy experts offered two categories of problems: (1) problems associated with the pursuit of behavior change strategies within the current policy and regulatory environment, given existing constraints; and (2) issues that are inherent to addressing the human dimensions of energy consumption.

[7] Of course, many engineers recognize the negative impacts of behavior on the savings of installed measures.

2.4.1.1 Regulatory-Related Challenges

The current regulatory environment makes the pursuit of behavior change strategies problematic on several fronts. The two most frequently cited problems in this regard concern the measurement and attribution of behavior-related energy savings on one hand, and the paucity of information regarding the persistence of those savings on the other hand.

Measurement and Attribution. Distinguishing behavior-related savings from technology-based and standards-based savings is a particularly difficult conundrum that has hampered the energy community's ability and desire to systematically pursue the promise of large behavior-related energy savings. In particular, the need for accountability within the regulatory environment has resulted in stringent measurement requirements aimed at documenting the cost-effectiveness of program choices. Most established measurement methodologies measure cost-effectiveness in terms of kilowatt-hours of energy saved per dollar of investment. And this approach has proven to be an easy and meaningful metric when applied to estimating energy savings from the adoption of more energy-efficient technologies. Nevertheless, this approach fails to distinguish between the amount of savings that should be attributed to the new technology itself and the behavioral elements associated with the technology, including its sales, adoption, installation, operation, and maintenance. There is an assumption of instant savings from new technologies that generally excludes the importance of the program delivery and the human context. In other words, savings that are typically attributed to new technologies might be more accurately conceptualized as a function of both the technology and of a variety of behaviors without which the technology would fail to reduce energy consumption or would do so to a lesser effect.

Further, this measurement and verification approach does nothing to identify an additional realm of potential energy savings that exists independently of the technologies at our disposal. These saving are embedded in everyday patterns of behavior and are associated with habits, customs, and lifestyles. On this front, potential energy savings are a reflection of specific social structures, value systems, and worldviews as well as existing patterns of behavior. This category of potential behavior-related energy savings is often ignored when considered within a regulatory environment.

Although it is possible to roughly measure the total direct effects, including free-ridership and spillover, the more salient question to ask is what are the costs of establishing and pursuing a strategy that is biased toward technological solutions simply because they tend to be more easily measured (or at least estimated)? Programs have indirect effects on participants and on the whole market. Why shouldn't indirect effects be measured? Because they are more difficult to measure? We have to ask: does the establishment of measurement specifications serve to guide or constrain the choice of program mechanisms?[8]

Paucity of Data. In addition to the challenges associated with the current paradigm for measuring and attributing energy savings, there is also a paucity of recent data with regard to the effectiveness and cost-effectiveness of different approaches to behavior-related energy savings. The lack of sufficient data also limits the ability of researchers to test and assess the validity of existing approaches to behavior change as well as the veracity of the theories that underlie these

[8] The CA EM&V Protocols have a protocol for indirect effects, but they are hard to measure, and the litigious situation between utilities and regulators directs resources toward the less disputable direct measures.

approaches. One recent exception is found in Tiedemann (2009), in which his meta-analysis looks at the relative impact of two social change paradigms. As reported by one energy expert, "[energy efficiency programs are] often based on ex-ante theories of behavior and they don't assess their success or accuracy ex-post." One remedy is to develop a strategic and coordinated research effort geared toward identifying and carrying out critical research projects that could identify the constellation of policies and programs that are the most effective while testing the underlying assumptions and theories that currently guide policy and program development.

Other Socially Constructed Challenges. In addition to the challenges outlined above, the current regulatory environment provides some additional challenges for achieving behavior-based energy savings. For example, current regulatory structures tend to focus on short- versus long-term energy savings, which can prove both advantageous and disadvantageous to behavior change strategies. While these strategies are an important component of achieving short-term energy savings, many energy experts believe that one of the real strengths of behavior-oriented programs is their ability to change cultural norms and, therefore, to create long-lasting change. However, the current focus on short-term, direct savings makes it nearly impossible to justify long-term programs.

Moreover, within most regulatory organizations, the predominant organizational culture is defined by cultural norms and assumptions that are rooted in a techno-economic framework (Ehrhardt-Martinez 2008; Lutzenhiser 2009). These norms strongly favor arguments based on engineering principles and economic models and tend to discount social and psychological explanations that offer a more complex vision of human behavior. The more complex and comprehensive vision recognizes (1) the important influence of social context in shaping behaviors and (2) the need to study the variation that occurs within populations as opposed to focusing on averages and other measures of central tendency. The existing bias toward a techno-economic framework has led to the development of funding and evaluation criteria that continue to favor the status quo approach while simultaneously limiting the amount of high-level support and commitment for complex behavior-based approaches. The continued predominance of information-focused programs as the primary behavior change model is evidence of this bias. People are assumed to be rational actors who will make the "right" decision if they are given sufficient information. Unfortunately there is an abundance of research indicating that although people like to think of themselves as rational actors, their behaviors reveal a different reality (Lutzenhiser 2009).

2.4.1.2 Inherent Challenges

In addition to the challenges associated with the regulatory environment, achieving behavioral change also involves a number of specific challenges that are inherent in human behavior. Interviews with energy experts revealed four inherent challenges of behavior-oriented efforts: getting people's interest, recognizing diversity, changing values, and the fickle nature of people. First among these is the difficulty of getting a large number of people to focus on nearly any topic of interest. Energy consumption and energy efficiency are no exception. As with all programs that rely on voluntary changes in behavior, success is partially dependent on a given program's ability to engage the public whether through formal media, informal channels, or a more complex mixture of approaches. An interdisciplinary social science approach is likely to offer the broadest set of resources for effectively addressing this challenge.

Behavior change strategies also require a more nuanced approach that recognizes and accommodates people's diverse backgrounds, personalities, value systems, constraints, and lifestyles. In short, people are different, and programs need to recognize and accommodate the ways in which people differ. As such, the level of success of behavior change strategies is particularly dependent on an approach that is successful at mapping the diversity that exists across the population and providing targeted strategies that effectively build on those differences. A focus on segmentation can be incongruent with a techno-economic approach that assumes uniform rules and mechanisms across the population (i.e., all rational actors respond in the same manner, all else being equal).

Programs that attempt to change values and value systems are particularly challenging and require broad-based efforts that are sustained over time. Some public health campaigns provide good examples of programs that challenge established ways of thinking (Valentine and Schuster 2002). For example, anti-smoking campaigns, drug awareness campaigns, and a variety of women's health campaigns challenge existing norms and values. These types of change require longer-term commitments than those found in conventional utility programs.

Finally, energy experts are also suspicious of the tendency for people to be fickle, unpredictable, and inconsistent in their behavior and are equally concerned as to the potential implications in terms of the reliability or persistence of behavior-based energy savings. This is clearly an area in need of additional research. Research on this topic needs to clearly distinguish how contexts and socio-demographic variables shape the persistence of energy savings across different types of programs.

2.4.2 Perceived benefits and strengths: On a general level, respondents indicated that behavior change strategies had much to offer and needed to be part of a comprehensive program. In particular people were quick to acknowledge that behavior change strategies offer a whole new set of untapped savings opportunities that need to be considered in today's energy and carbon-constrained world. Moreover, since people are the ones who demand specific energy services, an improved understanding of the human dimensions (social and behavioral) of energy consumption is a natural precursor to any effort at reducing energy consumption; behavior change strategies shouldn't simply be an add-on or marginalized effort. Finally, respondents indicated that behavior change strategies are necessary for helping people to attain a conscious-level awareness of their energy behaviors and a sense of their own potential efficacy in bringing about change (Klos et al. 2008).

Overall, respondents mentioned four specific benefits of behavior change strategies, characterizing them as (1) more insightful and effective, (2) capable of generating deeper and broader changes in existing patterns of energy consumption, (3) capable of generating lasting cultural change, and (4) necessary for achieving climate emission reduction goals.

2.4.2.1 More Insightful and Effective

As described by many of the energy professionals interviewed, behavior change strategies provide the means of developing a richer understanding of how energy-related decisions are made as well as more detailed information about how energy is used, misused, and wasted. If

adequately funded, the collection and application of this type of information could be an essential component in the development of more targeted and effective programs — programs that are not based on unproven assumptions but on empirical data that reveal the complexity and variation of behaviors and drivers across various segments of the population.

Given that human desires and behaviors are what ultimately drive energy consumption, many energy professionals argue that it must be an essential part of efforts to reduce energy consumption. And by addressing behavior in a proactive, targeted, and conscious manner, programs can also increase the cost-effectiveness of efforts to achieve sustainable levels of energy consumption.

2.4.2.2 Deeper and Broader Change

Programs and policies that directly address the behaviors of consumers, managers, technicians, and salespeople tend to increase the level of engagement, empowerment, and sense of efficacy of these same people. According to the experience of community-based social marketing initiatives, when people are engaged in an issue like energy efficiency or energy conservation and when they are empowered to take action toward implementing solutions, they are also likely to begin to think independently, be more proactive, and pursue additional changes (McKenzie-Mohr and Smith 1999). As a result, efforts that address behavior directly are likely to engage more minds in the pursuit of solutions and result in a broader and more diverse set of actions when compared to expert-driven, technology-centered approaches that offer prepackaged solutions for purchase. In other words, programs that engage people in recognizing and resolving their own energy conundrum promote action and allow efforts to build over time. These types of programs aren't just about changing the world one widget at a time, but instead offer the opportunity to move from "nibbling at the margins" to generating a new "normal" or a new behavior standard that is widespread and encompassing.

Moreover, approaches that are focused on new habits and lifestyles can generally be achieved through changes in choice and resolve alone and don't necessarily require the expenditure of significant financial resources or the purchase of new gadgets. Instead, adopting energy-saving behaviors often simply requires that people change their minds (Doppelt 2008). This type of behavior-based savings can be achieved over very short periods of time and at extremely low cost to households if programs and policies provide the human, social, and cultural capital and motivation needed to encourage people to rethink the way that they currently meet their energy service demands. In other words, a balanced set of investments should include both a focus on the expansion of human, social, and cultural capital as well as the development of new technologies. And a balanced portfolio is likely to maximize energy savings.

2.4.2.3 Potential for Long-Lasting Cultural Change

Another important strength of behavior-based approaches is that they offer the opportunity for long-lasting change achieved through the generation of new habits, personal norms, and social norms. In other words, if done correctly, behavior-based approaches can outlast specific technologies and provide for longer-term savings with market-level spillover. One respondent characterized the opportunity to tap into this potential in the following terms: "Think Community-Based Social Marketing on a larger scale."

In essence, behavior-based programs are about more than simply switching out gadgets. They are about establishing a lasting culture of efficiency via programs that inform, educate, empower and mobilize people around conservation. These types of programs address the value-based, norm-based, and structural causes of inefficiency and wasteful consumption. However, efforts to create cultural change and develop a culture of efficiency will require programs and policies that are focused on the social and behavioral dimensions of unnecessary energy consumption.

2.4.2.4 The Climate Change Imperative

Ultimately, traditional approaches to efficiency will be insufficient for achieving the existing greenhouse gas emissions reduction targets. Among the most oft-cited strengths of behavior change strategies is their ability to open up a whole new set of untapped energy savings opportunities both by facilitating and accelerating the market penetration of more energy-efficient technologies and via means that are based on establishing new habits and lifestyles. In addition, a behavior change approach provides the opportunity for deeper, faster, and longer lasting changes in energy consumption patterns. And, it is only through behavior change strategies that people can sufficiently attain a conscious-level awareness of their energy consumption behavior and of their own efficacy in bringing about change. As such, behavior change strategies are needed to meet climate change policy goals and accelerate our transition to a low carbon economy.

3. Factors that *Drive* Energy Efficiency versus Factors that *Enable* Energy Efficiency

The three main goals of this white paper are to identify common perceptions of behavior change strategies; identify contexts in which program administrators and implementers have been or are likely to be motivated to pursue behavior change strategies as a means of reducing energy consumption; and specify effective policy options to further motivate policymakers, program administrators, and program implementers to pursue behavior change strategies as a means of enhancing energy and carbon savings.

This section introduces a viable framework for pursuing behavior change strategies in a regulatory environment. The framework that is outlined here draws primarily from two sources: the lessons learned from similar experiences in the international development community on the one hand and the experiences of U.S. energy experts on the other. In terms of the former, the U.S. Agency for International Development (USAID) can provide rich insights from their own success in grappling with many of the issues currently facing utilities and regulatory organizations in the U.S.

Although the goals of the USAID, and utilities and utility regulators differ in substance, there are undeniable parallels between the two efforts. For example, USAID's efforts to achieve economic growth and increased productivity in many of the less developed countries of the world parallel the efforts of the utility industry to maintain its profitability and of the energy efficiency community to increase overall energy productivity in the U.S. Importantly, in order to achieve the desired transformations, both efforts must simultaneously address multiple dimensions of change, including the economic, technological, and social/behavioral dimensions.

And similar to the regulatory oversight that is part of most utility activities, the activities of the USAID are regulated by the U.S. Congress and are subject to multiple demands and constraints.

Efforts to increase energy efficiency also parallel efforts at USAID in other ways. For example, while the primary goal of USAID is to assist the world's most vulnerable populations in achieving economic growth and economic independence, the Agency also recognizes the importance of non-economic factors in achieving their goals. More specifically, while the Framework for US Foreign Assistance gives economic growth a central position in the U.S. foreign assistance program, it also recognizes the need to identify and address other important factors needed to help achieve this goal. Similarly, although the primary goal of utilities and regulators is to provide reliable sources of energy, it may also be necessary to promote energy efficiency and energy conservation through a variety of technological, social, and behavioral measures in order to achieve both reliable and environmentally sustainable ways of providing those resources.

At USAID, the primary focus has been on generating economic growth through technological innovation, investments in large infrastructure projects, and open trade policies using market mechanisms. A similar strategy has been perpetrated within the energy community, where the focus has been on ensuring the supply of reliable energy resources and on increasing energy efficiency through technological innovation, targeted investments, and national standards. With a focus on technology and economics, both approaches take something of a "if we build it, they will come" philosophy, assuming that the social and behavioral dimensions will generally sort themselves out if the technological and economic conditions are properly specified.

Not surprisingly, the historical efforts of the international development community have largely focused on establishing the "right" macroeconomic structures and accelerating the diffusion and adoption of more advanced technologies with the assumption that the benefits of increased productivity and wealth would eventually "trickle-down" to improve the lives of many of the individuals within the less developed societies. As such, this approach had little interest in efforts to involve the public at large. Instead, the public was generally seen as merely a passive recipient of development assistance. Over time, however, this framework proved problematic and, in many ways, ineffective. Today, the policies and programs of USAID and other international development organizations recognize the need to address both the *drivers* and the *enablers* of economic growth. In the USAID framework, drivers include both smart economic policies and technological innovation, while enablers include a diverse set of social and educational programs that facilitate technology adoption and widespread participation, involving the general public as active contributors to the development process.

As a result, new USAID programs not only address the economic and technological dimensions of international development, but also recognize the social and behavioral dimensions that are required to engage the public, enable the process of development, and accelerate change.

Energy experts report that efforts to achieve increased energy efficiency have been similarly biased toward technological and economic drivers due (at least in part) to their greater visibility and perceived ease of attribution and measurement. Meanwhile, the importance of social and behavioral conditions for change has largely remained invisible and their ability to enable and

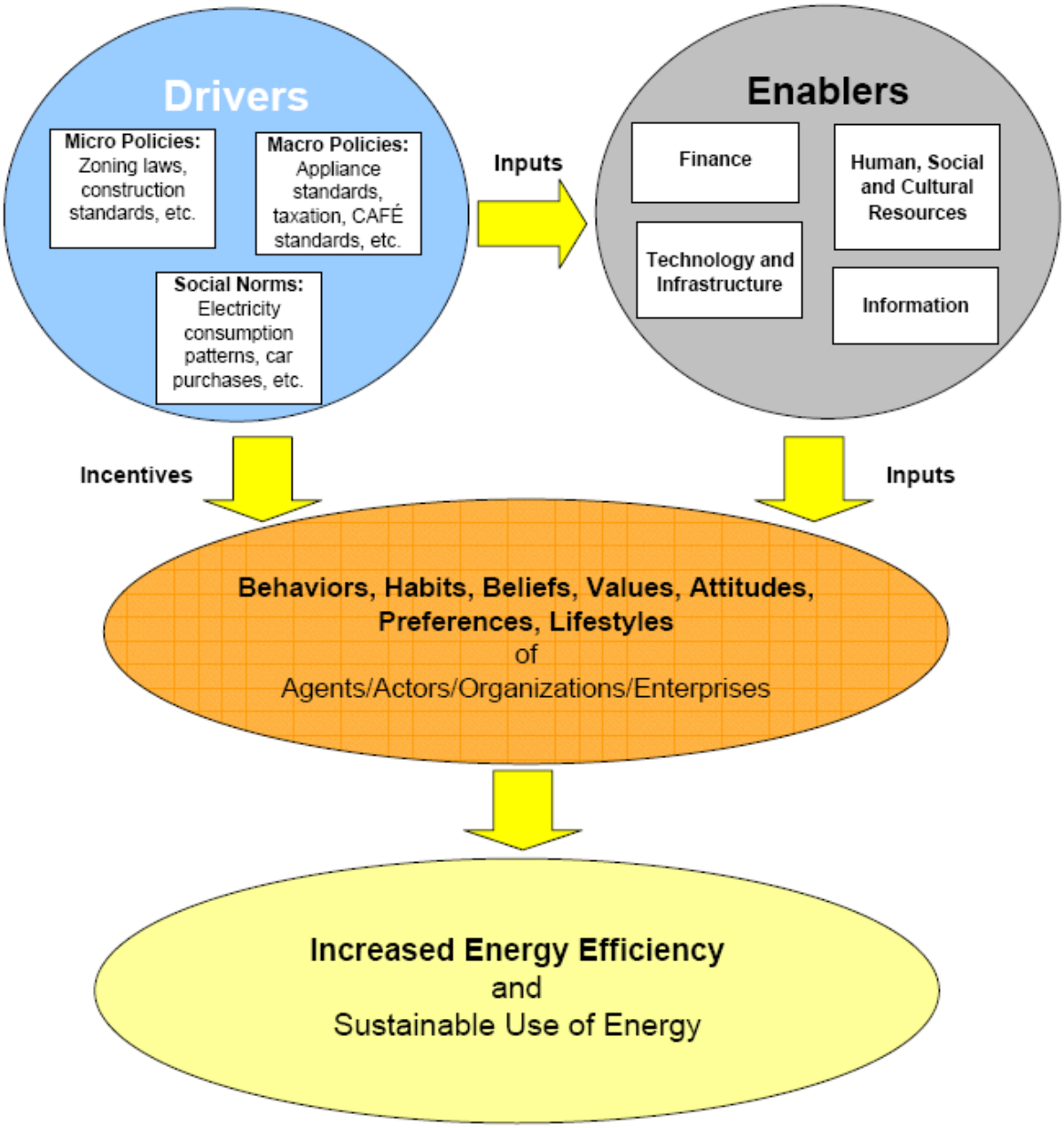
accelerate sought-after changes has largely been ignored. Instead, efforts have focused on measuring advances in technology as well as on the development of suitable economic drivers of efficiency at the expense of recognizing the importance of social and behavioral issues that comprise a critical element in enabling real change. As shown by the USAID example, however, other frameworks are often applied when working within a regulatory environment. The remainder of this section: (1) provides a description of the new USAID framework, (2) discusses the ways in which it has facilitated a more integrated approach that successfully recognizes the social and behavioral dimensions of change, and (3) begins to assess the possible application of this framework to the challenges faced by the energy utilities and regulators in the United States.

3.1. The USAID Framework

The focus of USAID's work is to help countries to achieve economic growth with the ultimate goal of reducing and eventually eliminating extreme poverty. From USAID's perspective, economic growth is the "surest way for countries to generate the resources they need to address illiteracy, poor health, and other development challenges on their own, and thus to emerge from dependence on foreign aid" (USAID 2008). According to the USAID Framework, the key to economic growth is ongoing growth in productivity, which requires producers to be motivated to search for and adopt a never-ending stream of productivity improvements. In other words, USAID recognizes that any single improvement in technology or management will only boost growth temporarily. In order to achieve sustained growth, efforts must address three critical components of change: the drivers, the enablers, and the actors or enterprises. The ***drivers*** include macro-policies, micro-policies, and social norms. They provide the motivational frameworks necessary for change. The ***enablers*** consist of the resources or inputs required by households and enterprises including financial resources, technological resources, information, and (of critical relevance here) human, social, and cultural resources. The ***enterprises*** (whether individuals, households, or companies) are the actors who must transform the policies and the resources into actual productivity gains. Effecting change requires a combination of *incentives* (provided by the drivers) and appropriate *inputs* (associated with the enablers). A careful consideration of both drivers and enablers is required to achieve the desired outcomes. Moreover, the USAID model also recognizes that achieving the desired outcomes is only possible via changes in the behaviors, values, habits, beliefs, lifestyles, and preferences of the actors involved. Figure 9 illustrates the USAID framework with a focus on energy efficiency.

3.1.1 How it integrates the social and behavioral dimensions of change: As noted above, in order to achieve increased productivity, USAID must change the behaviors, knowledge, attitudes, beliefs, and practices of the people and enterprises that generate the economic output and growth in productivity. They achieve these changes by providing policy direction, funding, and suitable infrastructure, but also through concerted efforts to enhance human resources and human capital all in ways that help motivate, facilitate, shape, and catalyze the behaviors of the people and enterprises in question. Specific efforts vary from traditional technical assistance and training programs that build human capital to the provision of micro-credit schemes that overcome financial and institutional barriers, to the use of social marketing campaigns that provide education and awareness and challenge existing social norms.

Figure 9: Framework for Energy Efficiency



3.1.2 Possible applications for energy utilities and regulators in the United States: Energy utilities and regulators can benefit from applying the USAID framework to issues of energy efficiency or energy productivity. In this case, the key to energy sustainability lies in finding the right drivers and enablers for rapid and continuous growth in energy efficiency and energy conservation. The agents of change are the people, households, companies, and organizations that consume energy. Effective strategies for achieving desired changes must include a variety of drivers, including macro-policies such as appliance standards, micro-policies such as local zoning laws and construction standards, and the activation of social norms regarding energy consumption practices, vehicle purchases, and housing patterns. These strategies must also include a variety of enablers. To date, the U.S. efficiency community has done fairly well in providing three of the four enablers included in Figure 9; however, for reasons already discussed in this report, relatively little attention has been given to the importance of human, social, and cultural resources. Importantly, a broader conception of productivity is needed; one that recognizes the importance of the larger social and behavioral environment in shaping the effectiveness of both technological and non-technological approaches to energy savings. (See Laitner and Ehrhardt-Martinez 2008 and Moezzi and Diamond 2005 for a discussion of energy productivity and the limits of energy efficiency.)

4. Existing Barriers and Structures that Motivate

Given the critical importance of behavior to the success of efforts to reduce energy consumption and increase energy efficiency, it is equally important to examine and gain a better understanding of the motivational structures that shape the interest and enthusiasm of program and policy staff to pursue behavior change strategies. This section explores existing incentives and disincentives as well as possible alternative scenarios for constructing suitable motivational structures. In general, our research revealed a preponderance of disincentives for incorporating behavior change strategies given the current regulatory structure and lack of adequate research on the topic. Specific incentives and disincentives are discussed below.

4.1 Existing Incentives and Disincentives

Policymakers, program administrators, and program implementers currently face more disincentives than incentives when deciding how much time, effort, and funding to provide for behavior change strategies. Energy professionals must consider a variety of competing and potentially conflicting goals when determining which strategies to pursue. Regulators and policymakers are generally most concerned with ensuring continued and reliable access to energy resources while also being fiscally accountable with regard to how ratepayer funds are being spent. Policymakers are increasingly concerned about global climate change and the need to reduce greenhouse gas emissions, while utilities must be concerned with being cost-competitive. Even program administrators and implementers must concern themselves with the cost-effectiveness of the energy programs and the measurability of their results.

Policymakers and regulators need to be forward-thinking and accountable to ratepayers. They need to be sure that funds are being wisely invested either in new power generation capacity or programs aimed at reducing future energy consumption so as to ensure that future demands don't exceed future supplies. Given that the energy saving attributes (level, reliability, and

persistence) of behavior change strategies and programs are less well documented and currently more difficult to measure (due to established measurement methodologies), there is an increased perceived level of risk to policymakers and regulators associated with pursuing behavior change strategies. Interestingly, while concerns over greenhouse gas emissions are likely to create a heightened interest in alternative means of saving energy, behavior change strategies are also likely to continue to be viewed as riskier than other types of programs — at least until more evidence of their energy-saving capacity is documented and measurement methodologies are adjusted so as to more accurately capture behavior-based energy savings.

The same limitations concerning measures of the cost-effectiveness of behavior change strategies makes investments in these programs problematic from an accountability perspective as well. In other words, as long as program administrators can choose between traditional, measured, and cost-effective programs on the one hand, and untraditional, quasi-established (and sometimes qualitative) behavior change programs on the other, they are likely to continue to choose the least-risky alternative. The critical point is that behavior-related energy savings are *perceived* as less reliable than technology-based savings, and the potential variability in savings holds important implications for calculations of cost-effectiveness and the risks associated with pursuing those programs.

Finally, it is critical to recognize that the current regulatory structure provides little leeway for program administrators and implementers. Their performance is closely tied to their ability to measure and document the savings associated with their particular programs. Given the current configuration of measurement and existing attribution methodologies, administrators and implementers may be at a disadvantage when they decide to pursue behavior change strategies as a significant part of their portfolio of programs.

A potential bright spot for behavior change strategies is related to concerns over customer satisfaction, which may represent one particularly important exception to the list of disincentives faced by program personnel. When adequately funded and correctly implemented, behavior-change strategies offer an ideal approach for tailoring programs to the different needs and interests of energy consumers. Focus groups and market segmentation research offer the possibility of gaining a better understanding of customers' existing attitudes, preferences, habits, beliefs, and lifestyles. This information could provide the basis of more targeted recommendations, suggestions, and programs, and improve overall levels of customer satisfaction.

4.2 Alternative Scenarios

From the perspective of policymakers and program administrators, the thought of instituting behavior change strategies is currently overwhelmed by the preponderance of disincentives discussed above. Nevertheless, some alternative scenarios are possible. The following ideas are suggested either as a potential means of inspiring or incentivizing program and policy personnel to pursue behavior change programs and policies or as potential mechanisms for reducing the perceived disincentives associated with pursuing such programs. An important place to start is with the documentation of the size of potential energy savings associated with behavior resources. Without adequate research and documentation, people tend to undervalue the heft of

savings that can be achieved through behavior programs. In addition to changing mental models, policymakers and program administrators would also benefit from efforts to rethink how best to collect and compile the data that are needed to distinguish effective from ineffective behavioral approaches and to rethink models of accountability and attribution.

4.2.1 Changing mental models: Creating a vision of the energy resources that could be saved by means of successful behavior change strategies is an essential and powerful tool for motivating staff to pursue behavior change and for achieving meaningful energy savings. Currently, advocates of behavior-based approaches must advocate for efforts to pursue these strategies without an established picture of the size, scope, costs, or benefits of those savings. Estimates of energy savings based on reliable research would go a long way toward increasing the credibility of behavior-based strategies as well as provide meaningful targets and facilitate comparisons when choosing between different strategies.

For example, energy experts currently vary significantly in their estimates of potential behavior-based energy savings. While some experts perceive potential saving as rather marginal, others suggest that behavior-based savings could rival or exceed those typically associated with technology-focused measures. In fact, preliminary research suggests that behavior resources can provide significant energy savings. For example, recent work by Gardner and Stern (2008) suggests that the potential behavior-related savings in the residential sector may exceed 25% of current levels of consumption. Similarly, a recent publication by Laitner et al. (2009) identifies a wide range of potential energy-saving behaviors and suggests that the right mix of policies and programs that combines behavioral and technological approaches to efficiency could reduce residential energy consumption by 22% (4.6 quads), a reduction of approximately 12% of total U.S. energy consumption.[9] These findings are also supported by a recent McKinsey study, which suggests that residential sector energy use could be reduced by 26% (roughly 6 quads of primary energy) by 2020 through the successful application of various energy efficiency initiatives (McKinsey and Company 2009).[10]

Regardless of the exact findings, additional research in this area would undoubtedly prove useful to policymakers and program administrators. Such research would reduce the risks and uncertainties associated with pursuing behavior-based programs and motivate program and policy staff to consider behavior-based programs as a viable alternative to more traditional, technology-based ones.

4.2.2 A common research platform: One of the most common reservations by energy experts about behavior change strategies and programs expressed throughout the surveys performed for this study concerned the lack of adequate and recent research on the effectiveness of these types of efforts. Unfortunately, the existing body of research on this topic is best characterized as fragmented, dated, and of limited breadth and scope. More research is clearly needed to better determine both the contextual robustness of different types of strategies as well as important variations in psycho-demographic and socio-demographic characteristics of different population segments and how they affect patterns of energy consumption, conservation, and efficiency. The

[9] This estimate includes energy consumed for personal transportation.
[10] The McKinsey study is focused on technology-based solutions in the residential sector and its estimates do not include the same breadth of potential behavior-related energy savings as compared to the Laitner et al. report.

lack of sufficient research is further complicated by the disjointed character of the many, small research agendas of individual utilities and research organizations, which has resulted in a somewhat fragmented body of knowledge. Moreover, the limited quantity of research and the disjointed approach to research have left substantial and important gaps in the knowledge base and resulted in some notable hesitation to pursue behavior change strategies.[11] Unfortunately, the longer that these important information gaps persist, the longer it is likely to take to inspire confidence in behavior change strategies.

Instead, research is needed to map the potential fertility of social, political, cultural, and economic contexts and to identify the ways in which energy consumption patterns vary across different segments of the population. By mapping the social geography, researchers can then experiment and study the types of programs that are most likely to succeed in different environments and within different population segments.

Such an effort would benefit greatly from coordination and collaboration on a national level. A national-level effort would expedite the research process and avoid the unnecessary duplication of research efforts, making a wider selection of information available in a shorter period of time. A national-level effort would also distribute the costs associated with building a comprehensive set of behavioral information. Such an effort should be more than an agreement to share research findings, but should also involve the development of a common research agenda, the prioritization of that agenda, and the development of uniform research methods so as to ensure the comparability of findings and the ability to build a practical base of knowledge. A current example of this type of collaborative research is the joint effort of the Northeast Energy Efficiency Partnership and the Northwest Energy Efficiency Alliance (and their respective utility partners) to design, fund, oversee, and benefit from research on end-use load research results.

A coordinated research effort could promote a range of research initiatives including experimental designs, surveys, and statistical research using secondary data. It could operate in collaboration with university programs and national energy laboratories already working in these areas and also serve to build additional social science research capacity on this topic. Research findings should be disseminated broadly to energy practitioners and others through existing energy conferences and journals.

4.2.3 Rethinking implementation, attribution, and evaluation: Motivating program and policy staff to pursue behavior change strategies must begin with a better appreciation and measurement of the role that behavior *already* plays in shaping and reducing energy demands. A good starting point is to recognize that energy systems will always operate within larger social systems and that individuals and organizations play important roles in defining the structures and norms of operation. As such, a more comprehensive picture of the role of behavior must consider how individuals and organizations both define and meet their energy service demands through the adoption and application of new technologies, the development of new patterns of behavior, and transitions to new ways of living.

[11] Gaps in social and behavioral research exist with regard to estimates of potential behavior-related energy savings, the identification of the most effective levers for achieving behavioral change, the identification of the barriers associated with each of the levers and means of overcoming them, developing methods for identifying and addressing diverse population segments, etc.

The development of a more comprehensive map of behavioral influences as well as the development of new attribution methodologies will require a systems approach that has the capacity to identify the ways in which behavior and technology simultaneously shape and are shaped by each other as well as the social structures in which they operate. Such an approach must also recognize that not all behaviors are the result of conscious decision making and that even when decisions are made consciously, assumptions of economic rationality are often ill-conceived.

By developing a more comprehensive understanding of behavior, researchers and energy practitioners can more accurately represent and measure the multiple causal relationships that result in particular energy outcomes. As such, meaningful measures of complex causal systems will require implementation and accountability frameworks that include the ability to account for both measures of *direct* causality and measures of ways in which behavior change strategies contribute to shifts in energy consumption trends *indirectly*. Such an approach provides the means of more accurately mapping *multi-layered* and *systemic* causal systems. This type of approach underlies the market effects research currently being carried out through CIEE for the California Public Utility Commission in new construction and high-bay lighting as well as the recent and ongoing evaluation of California's "Flex Your Power" campaign (Dougherty et al. 2009).

The rethinking of the role of behavior and behavior change strategies should also involve rethinking the ideal duration of specific interventions and the implications for measurement and evaluation requirements. In particular, behavior change strategies that involve shifts in cultural norms and practices or shifts in lifestyles are likely to involve longer-term efforts and require a shift away from the current predominant focus on short-term results.

The move from direct to systemic causality and from short-term to longer-term solutions also requires a rethinking of the planning paradigms used to determine the better course of action. In this case, logic models[12] are the tool of choice for planning and measuring programs with complex causal chains. They are also likely to prove useful in specifying the complex nature of the relationship between technology and behavior, as well as to make apparent the many ways in which the accomplishments of traditional programs could be enhanced through efforts to consciously address their human dimensions. As such, logic models offer the means of:

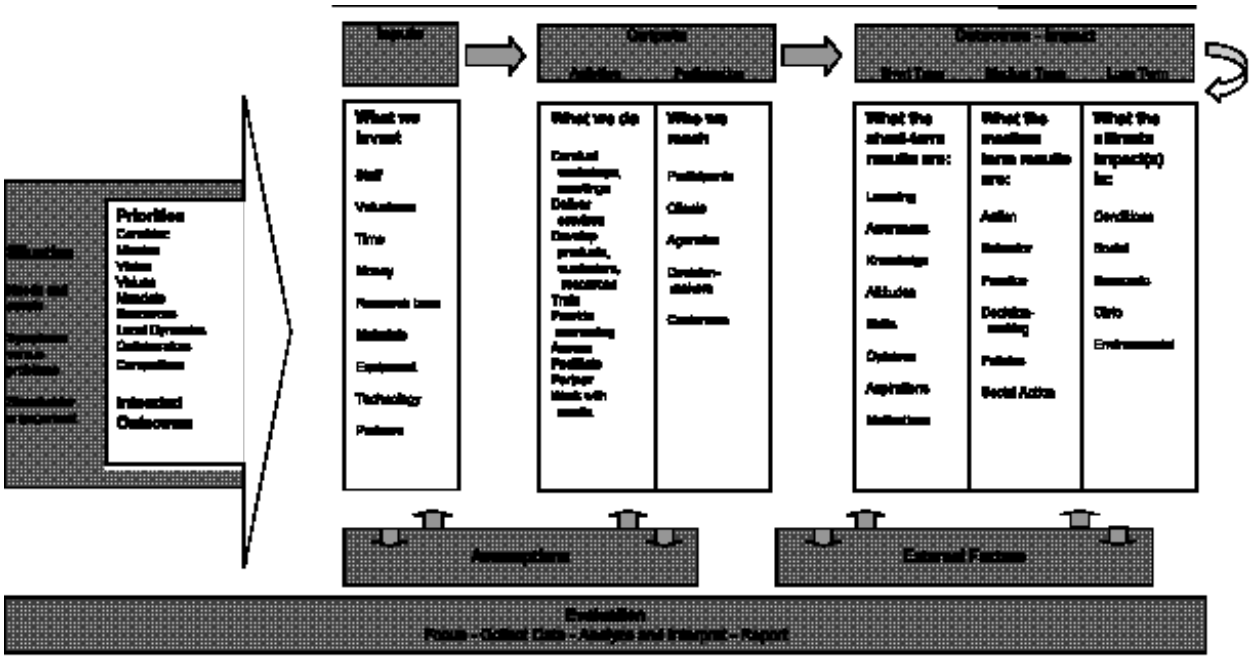
- raising the general level of awareness of the role that behavior plays in achieving energy efficiency goals,
- mapping the complex causal structures that result in energy savings,
- testing theories of behavior change so as to build better programs in the future, and

[12] Logic models are generally portrayed as graphical depictions of real life processes that also convey information about the underlying assumptions upon which a given activity is expected to lead to a specific result. In general, logic models illustrate a sequence of cause and effect relationships — or a systems approach to communicate the path toward a desired result. Importantly, they allow the user to describe the concepts that need to be considered when s/he seeks to explain the impact of a particular variable on a complex outcome. For this reason, logic models have proven to be a useful tool in program planning and evaluation during the past 20 years.

- correctly attributing savings to various program inputs — whether technological, behavioral, or otherwise.

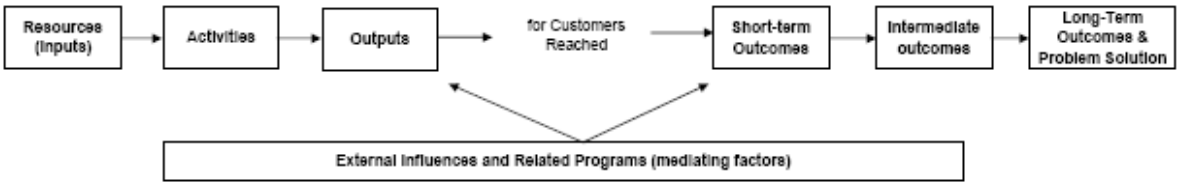
Logic models have been used extensively to improve the evaluation, monitoring, and refinement of programs in a variety of fields including health care, and other social and educational programs (Megdal et al. 2005). Carol Weiss (1998) is one of the early promoters of the use of program theory and logic models (Worthen et al. 1997). According to Weiss (1998), program theory is simply the application of theoretical explanations to a particular problem with the goal of identify potential causal relationships and the variables that are likely to play an important role in shaping outcomes. It is useful because it allows program planners to specify the underlying assumptions about how a program is expected to work. Logic models specify these relationships in a simple (or more complex) diagram. They are a tool for mapping the critical causal relationships among program elements and the problem to be solved. According to Megdal et al. (2005: 1045), "the elements of the logic model describe and place the causal sequence of program activities, outputs, immediate outcomes, and longer-term outcomes." Most notably, logic model elements can also be used to identify measurable indicators and assess program success. Figure 10 shows the various elements associated with a logic model, while Figure 11 shows the basic logic model format.

Figure 10: Program Action: Logic Model



Source: University of Wisconsin Cooperative Extension Program:

Figure 11: Basic Logic Model Format



As shown in Figure 11, activities require particular inputs and produce specified outputs. Taken together, resources, activities, and outputs are the core elements of any behavior change strategy. And any behavior change strategy should be expected to result in specific behavioral outcomes. In this case, activities might include developing marketing and advertising strategies, posting information on the Web, creating competitions, providing training, etc. These activities result in some measurable direct outputs such as promotional events, media advertisements, Web site hits, competitions, and workshops. Short-term outcomes might include increased awareness and knowledge regarding energy consumption and/or energy conservation, increased use of energy guide information, increased sales of targeted technologies, improved customer service, shift from on-peak to off-peak usage, etc. Intermediate and long-term outcomes might include increased consumer demand for higher efficiency standards, increased prevalence of retailer advocacy and promotion of energy-efficient products, targeted reductions in household energy consumption, etc.

Regardless of the specific activities, outputs, and outcomes, a well-specified logic model will allow for reliable measurement and the evaluation of program success using either quantitative or qualitative measures. But there are also a number of other benefits associated with the use of program logic models. In fact, Megdal et al. (2005) found that program logic models could be used to evaluate and augment the performance of programs run by the New York State Energy Research and Development Authority (NYSERDA). More specifically, Megdal et al. found numerous advantages for using logic models, including their ability to:

- promote critical thinking about programs,
- identify key indicators and researchable issues for evaluation research design,
- map linkages (and disconnects) between activities, outputs, and outcomes,
- provide a basis for program changes or status quo,
- tell the program story in a short, precise format,
- improve management, stakeholder, and policymaker comfort, and
- identify impacts related to changes in program design.

4.2.4 Measurement and accountability: Some energy experts (outside the state of California) suggest that behavior change strategies and behavior-related efficiency gains would be facilitated if regulatory agencies were to take a more macro approach to ensuring energy savings. Such an approach would be designed so as to provide more leeway to utilities and program administrators by letting them determine the right program mix to achieve desired energy savings targets. Instead of holding utilities accountable at the program level, the experts recommend that policymakers and program administrators be held accountable at the portfolio level as is done in California. This type of adjustment would give program and policy staff more flexibility in

determining the right mix of programs and policies and the ability to explore and experiment with as yet unproven behavioral programs based on well-researched design ideas. If program managers were simply given broad energy-saving mandates and then left to determine the best means of meeting them, they would be more likely to combine some traditional, technology-based approaches with more experimental behavioral programs — particularly if program administrators were provided with some incentive or mandate to select at least one program design from a list of experimental designs.

This type of approach would allow regulators to share the risks associated with pursuing untested behavior change strategies. By definition, such a program would also be more forgiving of failed programs if/when they were among those selected from a mutually agreed-upon list of experimental programs and were appropriately executed.

A related suggestion would reduce the disincentives to experimentation with behavior change strategies by shifting program goals from a focus on creating savings within a participant population to a focus on reducing the absolute levels of energy consumption across specific sectors. Portfolios would be evaluated based on their success in reducing overall levels of energy consumption. The effort to achieve this type of market impact would need to rely on synergism among many programs and intervention types. As a result, utilities would no longer need to worry about attributing savings to specific programs, and the educational, motivational and behavioral programs would commingle and increase impacts. The program evaluations would no longer need to account for the effects of spillover and free ridership, but they would still need to account for non-energy stimuli that would confound the utility efforts, such as economic disruptions, business growth, and new energy end-uses. This type of goal setting actually aligns well with societal goals on reducing greenhouse gas emissions and sustainability, because it tries to reduce consumption, which means less need for electricity generation.

4.2.5 Implications and outcomes: Perhaps the most important motivating factor for pursuing behavior change strategies is the dramatically expanded range of energy and carbon emissions savings targets that have recently been specified as a part of efforts aimed at addressing global climate change. For example, in 2006 the California legislature passed Assembly Bill 32 setting statewide greenhouse gas (GHG) emission reduction targets. The legislation specified that GHG emissions must be reduced to 1990 levels by 2020 and be reduced to 80% below 1990 levels by 2050. Similar efforts are underway to establish GHG emissions reduction targets at the national level, as recently proposed in the American Clean Energy and Security Act of 2009.

In order to achieve the dramatic energy reductions within the short span of time available, program administrators and others will need to pursue ***all*** of the cost-effective solutions they can find. The fact of the matter is that programs that overlook or ignore the potential energy savings associated with behavior change strategies are likely to fail to meet the new, expanded emissions targets. In the right environment, policy and program personnel are likely to find this particular motivation especially compelling. The more that regulators can do to encourage coordinated experimentation and innovation across utilities, the faster we will successfully identify the most viable and effective behavior change strategies.

4.2.6 Hiring and employee incentives: In the interviews conducted for this report, employees of utilities and regulatory agencies suggest that peer-to-peer communications, acknowledgements, and incentives would also help to provide the necessary motivation to pursue behavior change strategies; to provide the means for feedback, discussion and guidance; and to develop a reliable knowledge base from which to refine behavior change strategies. Similarly, having more social scientists on staff would provide the necessary expertise to maximize the success of behavior change strategies and to expedite progress in this field. Hiring social scientists at more senior management levels is particularly important to create the imperative and provide support at the most senior levels as needed to effectively change the existing work culture.

5. Insights from Research on High Performance Organizations

This section draws on the work of David Osborne (Osborne and Plastrik 2000), a coauthor of several books on government reform who has consulted with all levels of government organizations to help develop strategies for improving their performance. By combining Osborne's insights with the ideas and comments gathered from our survey of energy experts and the online survey of energy professionals, this section seeks to identify additional potential barriers to optimizing program performance and to suggest viable means of overcoming those barriers.

Given the vast potential of energy savings associated with behavior change strategies described above, an obvious question that begs to be answered is: why isn't the promise of increased savings sufficient to motivate program and policy staff to pursue them? If cost-effective savings are available in such large quantities, why are behavior change strategies under-represented in (or in many cases absent from) existing portfolios? A possible and somewhat likely answer is that existing organizational structures and systems aren't functioning optimally so as to maximize energy savings.

Osborne's approach is well suited to addressing the problems associated with the motivation of policymakers and program staff in large bureaucratic organizations. In the case of regulatory agencies and utilities, his approach is of particular value given its focus on creating approaches that continuously look for means of increasing organizational efficiency and its emphasis on creating suitable structures and empowering people to pursue good ideas, to innovate, to invest, and to take appropriate risks with the ultimate goal of being more effective in a dynamic way.

The in-depth interviews performed for this report revealed that energy experts were concerned with what they characterized as *an overly controlled or overly rigid environment that falls short in providing adequate space for innovation and experimentation*. One means of facilitating and encouraging policymakers and program managers to pursue behavior change strategies is to create the space and the conditions needed for a more flexible environment in which people can respond to problems in more entrepreneurial ways. As such, people need to be encouraged to continuously look for ways to improve performance via innovation, investments, and educated risk taking.

The successful employment of behavioral approaches to energy efficiency requires some rethinking and reinvention, and some innovation and experimentation. As discussed earlier, an important first step is for policy and program staff to rethink or re-imagine what behavior encompasses and the potential impact that it can have on energy savings. In addition, at the organizational level, more space can be opened up for innovation through the process of reinvention.

Osborne defines reinvention as the process of transforming systems and organizations to dramatically increase effectiveness, efficiency, adaptability, and capacity to innovate. This transformation can be accomplished in a variety of ways and may involve changing the purpose of the department, program, or organization; reorganizing the structure of accountability; changing existing incentive structures; redefining power structures; and/or changing the organizational culture.

Innovation is clearly already part of the CPUC's mandate. According to the organization's own mission statement:

> *The California Public Utilities Commission serves the public interest by protecting consumers and ensuring the provision of safe, reliable utility service and infrastructure at reasonable rates, with a commitment to environmental enhancement and a healthy California economy. We regulate utility services, stimulate innovation, and promote competitive markets, where possible, in the communications, energy, transportation, and water industries.* [Emphasis added.]

One means of creating extra space for innovation and experimentation is through the creation of reinvention laboratories.

5.1 Creating Reinvention Laboratories[13]

A reinvention laboratory can be thought of as "a small patch of temporarily liberated ground in the battlefield over control in government. It is an experiment in decontrol, often carried out at the front lines. As a tool for bottom-up empowerment, reinvention labs turn loose selected organizations without having to free everyone" (Osborne and Plastrik 2000).

Although the terminology was originally developed for reforming large government bureaucracies, Osborne extends the approach to other large organizations and espouses using the concept on *parts of the organization* rather than only on the whole. In order to create greater flexibility to develop knowledge and best practices in a particular area of interest, Osborne

[13] At the first Reinvention Lab Conference at Hunt Valley, Maryland, in October 1993, a Reinvention Lab was defined as (NPR 1998):

> *... a place that cuts through "red tape," exceeds customer expectations, and unleashes innovations for improvements from its employees.*

That definition remains true even today. The Reinvention Labs are pushing the envelope of change. They are designated to lead the way and set the pace of change. They are asked to experiment with new processes and new ways of doing business. They are called upon to be creative and innovative, and *radically* (emphasis added) improve service and performance. They are expected to show all of us, government and non-government alike, the way to a future, common sense government that serves the public efficiently and effectively (NPR 1998).

recommends designating specific units or programs to be reinvention labs — places where workers can reengineer their work processes to fully accomplish their missions, authority and responsibility can be fully delegated, regulations are replaced with incentives, and *success is measured by customer satisfaction or new insights toward achieving the organizational mission*.

The benefits of creating reinvention labs can be numerous. For example, reinvention labs can give innovative leaders more room to move existing improvements forward. They can get the organization's reinvention juices flowing. They can ease the difficulty of obtaining waivers that would be required in more rigid regulatory environments. They can shield innovators from bureaucratic opposition and other obstacles to new ways of doing things. And, importantly, reinvention labs can substantially increase opportunities to build cross-sector and cross-agency partnerships.

With the right staff, the establishment of energy efficiency reinvention labs in utilities and among regulators could provide the space and flexibility needed to innovate, experiment with, and validate specific behavior change strategies and programs. This type of approach would create a "safe space" and an agenda for the exploration of behavior change strategies and could reduce and distribute the risks of investing in the necessary research and development.

The concept of a reinvention laboratory differs from ad hoc brainstorming or committees that "think outside the box" in that the management commitment is long term, ongoing, and open-ended in terms of scope. The ongoing commitment also implies a fairly large and robust organization, because it involves a commitment of human resources.

5.2 Separating Steering and Rowing

Apart from what might be achieved through the creation of reinvention labs, the pursuit of innovative programs would benefit from ensuring flexibility in program choice and program design. To use Osborne's terminology, policymakers and regulators should steer while program administrators and implementers should row. In other words, policymakers should be concerned with setting goals, objectives, and standards for the organizations that they regulate, while program personnel should be focused on finding the best means of achieving those goals and objectives. Unfortunately policymakers often get too involved in the details of *how* things get done, stifling creativity and innovation. Uncoupling is suggested by Osborne as a means of reducing the tendency of policymakers and regulators to get too involved with the management and process as opposed to focusing on steering the ship.[14]

Two potentially useful ways in which uncoupling may prove to be particularly valuable include working with one or more private nonprofit or for-profit organizations who can bring an independent and non-governmental perspective to determining how best to proceed on a particular issue (for example, achieving increased energy efficiency through behavior change strategies), and separating regulatory and measurement/compliance functions.

[14] This is an approach that has already been embraced by the California Public Utilities Commission with limited success. Survey respondents indicate that, in the case of California, more structure may be required.

Either of these applications can *provide more space and flexibility in terms of how behavior change strategies and non-behavior change strategies might be defined, implemented, and measured.* By providing flexibility of choice, the existing barriers and deterrents to the pursuit of behavior-based programs are likely to be diminished, and programs focused on conservation and energy-efficient behaviors will have an opportunity to become a more predominant part of the mix of programs. This insight from Osborne parallels the discussion above about flexibility in setting goals at the portfolio level.

5.3 Performance Measurement

The lengthening of program and evaluation cycles is likely to increase motivation to pursue behavior change strategies, while shorter cycles are likely to reduce motivation. Given the difficulties associated with the development of new programs in general, shorter program and evaluation cycles are likely to increase the perceived risk associated with choosing new types of programs. When given the choice, for example, between implementing strategies that are tried and tested with long histories of well-documented levels of energy savings and those that are newer, less well tested and with savings estimates that are less well defined, most people will choose to implement the status quo. This is particularly true when the program and evaluation cycles are short, since there is little time for learning and adjustment of program strategies.

Another concern when working with behavior change strategies is the need to provide sufficient time to adjust to the complexities of working with a diverse population. In order to maximize their effectiveness, behavior change strategies need to recognize the important patterns of variation within populations of interest. Moreover, the most effective behavior change strategies will adjust their approach in accordance with the characteristics of defined population segments. The process of identifying each relevant population segment as well as the implementation of subsequent adjustments tends to lengthen the optimal length of program and evaluation cycles for behavior-based strategies.

In addition to the need for longer-term performance periods, Osborne and Plastrik (2000) suggest that a comprehensive evaluation system should include both qualitative and quantitative measures of customer satisfaction and service quality and that customers also be involved in choosing performance indicators. Osborne's suggestion was echoed in an informal feedback session performed by the authors of this paper at the ACEEE Summer Study for Energy Efficiency in Buildings in which a group of 30–40 energy experts responded to a series of questions on the topic. Respondents felt that behavior change strategies are likely to increase overall levels of customer satisfaction. Data on customer satisfaction are currently collected and reported by J.D. Powers for medium and large electric utilities[15] across the nation (J.D. Powers and Associates 2009); however, no comparisons are currently made to assess the role of behavior change strategies in shaping levels of customer satisfaction.

5.4 Organizational Structure and Organizational Norms as Barriers to the Pursuit of Behavior Change Strategies

[15] J.D. Powers classified medium-sized electric utilities as those with at least 125,000 residential customers but less than 500,000 customers. Large utilities include those with 500,000 or more customers.

The promise of increased energy savings is insufficient to motivate program and policy staff to pursue behavior change strategies due (in part) to existing norms and structures that discourage experimentation and the possibility of limited, short-term savings. The in-depth interviews performed for this report revealed that energy experts were concerned with what they characterized as *an overly controlled or overly rigid environment that falls short in providing adequate space for innovation and experimentation*. A variety of steps can be taken to create the appropriate organizational space and culture that would help motive new thinking. Among the ideas discussed in this section are:

- Establishment of energy efficiency and sustainable consumption reinvention labs to provide a "safe space" and an agenda for the exploration of behavior change strategies and to reduce and distribute the risks of investing in the necessary research and development.
- Providing program personnel with greater flexibility in the means that they employ to achieve their goals.
- Lengthening program and evaluation cycles to reduce the perceived risk associated with choosing new types of programs.

6. The Benefits Offered by an Expanded Vision of Utility Regulators' Purview

Is spending on behavior change strategies and programs currently within the purview of utility regulators? Given the difficulty in documenting and attributing cost-effective savings associate with behavior change strategies and programs, can regulators adequately justify spending ratepayer money on behavior change strategies and programs in an attempt to increase energy conservation and efficiency, and/or reduce energy service demands?

An understanding of how the role of investor-owned utilities (IOUs) has changed over time will help to answer these questions. Of particular note is the way that many utilities have adjusted their role in response to changes in state policies concerning economic development and environmental quality. Prior to the 1970s, for example, some electric utilities not only sold, installed, and serviced appliances, but they were also the prime movers behind the campaigns for all-electric homes (Wright 1957, 1959). Then, during and following the energy crises of the 1970s, many jurisdictions encouraged their electric utilities to become "full service energy companies," providing a variety of residential, commercial, and industrial programs to increase energy efficiency. Energy efficiency was then seen as the best way to offset consumer complaints about sharp increases in energy prices. (And evidence suggests that this perspective continues to predominate.)

However, since the 1970s, especially in times of recession, many commissions, often with legislative approval, have authorized or mandated special utility rate offsets and other programs to attempt to keep larger users on the system, or to attract new business (NARUC 1989; WSJ 1987).[16] Many of these programs have been targeted to particular industries or other customer classes.[17]

[16] The New Mexico commission even went to the extent of giving at least initial approval to an El Paso Electric Co.

During the last three decades, four other significant developments have occurred: integrated resource planning; the integration of environmental and other externalities into utility planning; decoupling; and the use of the utilities to support state policies.

Each of these four developments prompted traditional utility planners to seek greater cost-effectiveness in the use of electric energy by extending utility plans to include renewable energy and energy efficiency technologies. At the same time, the goals of many IOUs have been expanded to incorporate specific state policy goals beyond the simple provision of energy services.

In part, the state has been able to infuse its own goals into the utility companies' strategies because regulated utilities are considered to be "public service" companies. Public utilities hold a critical position in the economy because their product is used by all enterprises, and represents a significant expense for most. Moreover, relatively small changes in energy prices or energy efficiency can have significant impacts on production cost, economic activity, and job creation.

In addition to their public commitments, utilities are often in control of a variety of resources (financial, human, and otherwise) that can provide the means for carrying out public policy. Some of these resources include economies of scale; a wide range of services provided to customers; concentrated technical expertise; access to a relatively low-cost capital; and, not least, a large measure of investor and regulatory confidence in their ability to comply with public policy concerns in a way that meets market expectations.

Given the unique characteristics of utilities and as long as they act in accord with overall public policy, cost recovery through the ratemaking process is more or less assured (within certain limits). In sum, many utilities are in a powerful position to exercise a leadership function in the market, and this has the potential for assisting the rest of the market to a fuller achievement of its potential.

The California legislature also has determined that state agencies do have an active role to play in energy efficiency, job creation, improving the cost-effectiveness of the low-income housing stock, blight reduction, and the stimulation of industrial activity and economic development. The legislature's concern about job creation is found in a variety of statutes. Section 800 of the California Public Resources Code notes, for example, that it is "the policy of the State of California that the location and operation of thermal electric power plants shall enhance public benefits and protect against or minimize adverse effects on the public, the ecology of the land and its wildlife, and the ecology of state waters and their aquatic life, *and that the public's opportunity to enjoy the material, physical and aesthetic benefits of its resources shall be preserved to the greatest extent feasible* [emphasis added]. The code further notes that it is also the policy of the state to encourage the development of resources that have "the potential of

program to buy up non-utility businesses outside its service area, and move them into its service territory (NARUC 1989).

[17] For example, the Arizona commission at one time allowed the rates charged by the Arizona Public Service to copper producers in Arizona to vary with the price of copper on the New York Stock Exchange (NARUC 1986; PUF 1984).

providing direct economic benefit to the public [emphasis added], while helping to conserve limited fossil fuel resources and promoting air cleanliness" (CALAW 2009).

Finally, the legislature further declared that it is the policy of the state to encourage planning by the state's electric utilities toward the above-stated objectives and to assist the utilities in their evaluations of the effects on the environment of proposed thermal power plant sites. To that end, a State Power Plant Siting Committee was established to coordinate with the utilities and to carry out specific responsibilities as defined in the Public Utilities Code and the Public Resources Code.

In the California Codes on Public Resources, the Legislature noted in Section 25001 that "electrical energy is essential to the health, safety and welfare of the people of this state and to the state economy, and that it is the responsibility of state government to ensure that a reliable supply of electrical energy is maintained at a level consistent with the need for such energy for protection of public health and safety, for promotion of the general welfare, and for environmental quality protection" (CALAW 2009). In a complementary way, the legislature in Section 25002 declared that "the present rapid rate of growth in demand for electric energy is in part due to wasteful, uneconomic, inefficient, and unnecessary uses of power." The Act continues in Section 25003: "in planning for future electrical generating and related transmission facilities state, regional, and local plans for land use, urban expansion, transportation systems, environmental protection, and economic development should be considered."

Given this backdrop, one issue for the California Public Utilities Commission is to determine just how much the natural gas and electric utilities should spend on programs deemed to be prudent and cost-effective. A reasonable interpretation is that the utilities should make all investments that are cost-effective, including investments in behavior change strategies. In addition, decisions regarding spending levels and program strategies must often be consistent with and supportive of the goals and priorities specified in state policy. As such, behavior change strategies that enhance the return and cost-effectiveness of utility investments (especially in cases where they extend the public purpose as shaped by state law) should be pursued. In other words, the CPUC and its regulated entities should consistently seek to use behavior change strategies to amplify, catalyze, and accelerate their existing efforts in ways that increase the probability of success in meeting their own goals as well as the goals of state policy.

7. Behavioral Change Strategies and the Role of Social Sciences

This section identifies, assesses, and discusses three behavior change strategies that exemplify some of the ways in which behavior change strategies can reduce energy consumption both directly and indirectly. Each was selected to illustrate the potential for success in recent behavioral program interventions.

7.1 Tailored Feedback — Positive Energy™

Positive Energy uses behavioral science and direct marketing expertise to give energy consumers the information, motivation, and specific tools that they need to reduce their energy consumption. More specifically, Positive Energy uses social norms and tailored feedback to

provide utility customers with targeted information and social cues that help them understand their own energy consumption patterns. Not only does this information show them how their energy consumption patterns compare to other people in similar circumstances, it also provides information regarding actions that they can take to most effectively reduce their energy consumption. This program uses behavior change strategies rooted in the academic research of Robert Cialdini and Wesley Schultz (Cialdini 2005, 2007; Cialdini et al 1990; Schultz et al. 2007) and others in the social-psychology community with the goal of developing a means of applying social pressure and control mechanisms to energy conservation.

In 2008 Positive Energy initiated their first program working with the Sacramento Municipal Utility District (SMUD). The program provides utility customers with either monthly or quarterly statements (separate from the utility bill). The statements provide a variety of customer-specific energy use data along with targeted tips for reducing their energy consumption. Households are provided with electricity consumption data that indicates the kilowatt-hours of electricity consumed for each month of the past year as well as a comparison of electricity consumption for the current month with the level consumed for the same month in the previous year. Importantly, the reports also provide households with information regarding how their energy consumption patterns compare to their neighbors with similar housing characteristics. By comparing household consumption patterns to either average neighborhood consumption levels or the consumption levels of their energy-efficient neighbors, Positive Energy is providing consumers with social cues regarding the social norms of energy consumption that they wouldn't otherwise have access to. As suggested from the research on this topic, individuals use these social cues to assess the "appropriate" or normative level of energy consumption. Positive Energy uses social science research to thoughtfully structure the information so as to motivate customers to reduce their energy consumption.

Finally, Positive Energy also provides customers with targeted tips regarding the actions that they can take to reduce their level of energy consumption. Through data mining techniques that combine data on housing stock and purchasing trends, Positive Energy is able to provide customers with a set of relevant suggestions including information on low cost and no cost actions as well as energy saving purchases and investments. By providing information that was previously unavailable, social cues, and actionable suggestions, this approach has achieved electricity savings of 2–3% in the first year (Klos 2009; Ehrhardt-Martinez 2009). Positive Energy's plans for further refinement of this experimental approach may lead to an even more substantial and cost-effective decline in levels of energy consumption among participants. Among the promising modifications is the integration of electronic feedback devises that will provide more frequent feedback to energy consumers.

7.2 Segmentation and Social Marketing

Segmentation and social marketing efforts have proven effective at increasing behavior-based energy savings. Segmentation is particularly important as it provides a means of seeing the complexity and variation that exists within groups of people and encourages program implementers to recognize the ineffectiveness of targeting the "average" consumer. The real strength of segmentation is that it provides utilities and others with a better understanding of their audience/clientele and allows them to refine their messages to meet the unique characteristics of the group(s) in question.

According to a recent publication on this topic prepared for the CPUC, segmentation is important because it can draw "attention to customer perspectives and the texture of the population of interest, which otherwise may be seen primarily as averages or dominant stereotypes." Moreover, it helps planners to overcome the tendency to think of customers in abstract, context-less ways (Lutzenhiser 2009).

Social marketing uses segmentation results to change attitudes, encourage new behaviors, and provide information. This approach is simultaneously concerned with the diffusion and adoption of ideas and technologies and the use of social and psychological mechanisms to facilitate that diffusion. For instance, many social marketing programs attempt to create lasting behavioral change through the use of public and private commitments that have proven to be important mechanisms for internalizing behavioral motivations. Programs that rely on commitments are based on the minimal justification principle, which "emphasizes the distinction between strong and weak external justifications for behavior." (Katzev and Johnson 1987). According to the principle, powerful external justifications result in short-lived behavioral changes, while moderate justifications are more likely to generate strong internal mechanisms of control and the perception among program participants that the motivation to conserve is internally motivated, resulting in longer-lived behavioral change.

Programs that combine social marketing initiatives with market segmentation studies can be particularly effective in achieving energy reductions. SRI uses a particular approach to segmentation that uses psycho-demographic measures to identify the key motivating forces in people's lives (Guns 2007 as discussed in Ehrhardt-Martinez 2008). When combined with information about the resources that individuals have access to and their ability to realize their motivations, this approach to market segmentation can provide important insights into decision making and likely behavioral outcomes. Gaining these insights allows for more successful communications, because it helps frame the message in a way that accounts for the particular knowledge and resources of different audiences, the media that they are likely to access and pay attention to, and the types of incentives that they are likely to find appealing.

According to SRI, it is important to recognize that the diverse public to whom our communications efforts are aimed is more limited in terms of resources than we might initially believe. For example, while most communications are high level and abstract, only 10–25% of adults comprehend sophisticated messages. Similarly, only 49% of Americans bought even a single book last year, and less than 10% of Americans ever attend meetings or write opinions.

In terms of climate change marketing specifically, SRI reports that most people are tuning out, and when they are listening what they learn is unlikely to change behavior. As such, increasing the success of efforts to reduce energy consumption and climate change emissions can't simply rely on sharing information about the problem and/or voluntary actions. Instead they require targeted efforts to motivate different types of people with access to different sets of resources.

When combined with social marketing efforts, segmentation offers the possibility of being particularly effective. One way to think about the applicability of social marketing as a means of creating behavioral change is to situate social marketing work within Rothschild's Behavioral Management Continuum, which ranges from using education and communication initiatives on

one end to using policy advocacy and the force of law on the other end (Maibach 2007 as discussed in Ehrhardt-Martinez 2008). Marketing falls between the two endpoints on the continuum and seeks to provide people and organizations with new options that are intended to be more attractive to them. Marketing initiatives are particularly well suited to behavior change strategies when the audience is neither inclined nor resistant to engage in the behavior in question, when self-interest can be conveyed, when the competition is active but beatable, and when the behavior is hard to adopt without help.

SRI uses psychology to analyze the dynamics underlying consumer preferences and choices. The system distinguishes differences in motivation, but also captures the psychological and material constraints on consumer behavior. Recently, an electric utility used this system to increase participation in its energy-conservation program by developing a targeted direct mail campaign. Two distinctly different population segments were identified as key targets. By developing unique strategies for each audience and identifying zip codes with high percentages of each target, the utility reported a 25% increase in participation (Guns 2007 as discussed in Ehrhardt-Martinez 2008).

7.3 Active Education

Research indicates that education initiatives are most appropriate when the audience is inclined to behave the way we want them to, when competing activities are weak, and when the behavior is relatively easy to adopt (Dietz and Stern 2002). The Alliance to Save Energy's (ASE) Green Schools Program engages students in creating energy-saving activities in their schools, using hands-on, real-world projects. The ASE program goals are twofold: to help free up more resources for education while also strengthening academic learning. Through basic changes in operations, maintenance, and individual behavior, ASE reports that their Green Schools program has achieved reductions in energy use of 5 to 15% among participating schools (ASE 2008). In addition, the program encourages students to apply the lessons of energy efficiency messages in their homes and communities.

The Green Schools program is specifically designed to work at the district level where it enrolls 5–15 schools at a time. At each school, teachers, custodial staff, administrators, and students form a team and carry out the program. The team generally begins by creating its own customized plan for teaching about energy, saving energy in school, creating school-wide energy awareness, and taking the message home and into the local community. Each school's efforts are supported by frequent school visits and feedback on their monthly energy usage. In addition, the teams have the opportunity to compare notes during mid-year planning meetings and an end-of-the-school-year celebration.

Students, staff, and teachers are motivated, empowered, and engaged in the process. In addition to identifying behavior change strategies and aiding in their implementation, participants actively monitor and evaluate changing levels of energy consumption and the impact on energy costs throughout the program. According to the ASE, the teams typically save between 5 and 15% on their schools' electric costs. Part of the motivation is provided through the establishment of specific savings sharing arrangements in which most districts agree to return a portion of the no-cost dollar savings back to the schools in support of the program (the remainder of the savings

stays at the district level). In addition to the knowledge gained and the sense of empowerment that the program enables, building services and custodial staff are able to develop a new set of skills and experience. In short, the commitment and reinvestment provide long-term energy-saving benefits, reduce operating costs, increase human capital, empower community action, and provide evidence of the effectiveness of behavior change strategies. Perhaps most importantly, the combination of these energy and non-energy benefits is likely to result in more informed choices in the future.

Other non-energy benefits achieved through the ASE's program include expanding on student learning and leadership, meeting curriculum requirements, and enhancing staff relations and school morale. From an academic perspective, energy efficiency and environmental issues are meaningful in the real world, and they also lend themselves to hands-on approaches to teaching and learning. These topics and approaches provide teachers with a way of adding meaning and excitement to what might otherwise be boring academic exercises.[18] The program also makes teaching about energy and efficiency easy by providing teachers with a variety of prepared resources, and it is aligned with state curriculum standards. Finally, the ASE reports indicate that the program has been successful in building stronger relationships between teachers and school facilities staff that are likely to enhance energy savings and build a stronger sense of community.

8. Conclusions and Recommendations

8.1 Conclusions

The current pool of potential, behavior-based energy savings is large, frequently ignored, increasingly accessible, and of significant importance in meeting both short-term and long-term energy and climate change goals. Among the energy experts interviewed for this paper, behavior change strategies were recognized as offering a valuable means of accelerating the pace of energy savings, increasing the overall level of savings potential, and expanding the longevity and sustainability of energy savings. Moreover, behavior change strategies could also help close the expansive energy efficiency gap that exists between potential and actual energy efficiency savings as well as the gap between favorable consumer attitudes and less favorable behaviors.

As recently as November 2008, the CPUC vigorously reiterated its support for behavioral programs:

> *In D.07-10-032, we reaffirmed our support for ME&O [Marketing, Education and Outreach] activities as 'central to transforming energy efficiency from a program to a lifestyle'[19] and as an essential component in promoting energy efficiency behaviors and actions to customers. We stated the need to implement a more strategic use of the hundreds of millions of dollars of ratepayer ME&O funds. An ME&O strategy has been adopted through the Strategic Plan, and the implementation of key objectives in this area*

[18] According to the ASE, this program has helped students to learn enough to make presentations to the school board on energy efficiency retrofit recommendations, author pieces for the local newspaper, and even conduct energy audits for local small businesses, among other activities (ASE 2008).
[19] 3 D.07-10-032, pp. 53–54.

> *is currently underway. These implementation efforts include a market assessment, brand assessment/creation and the development of a web portal.*[20]

This emphasis, however, focuses on being strategic in its use, rather than in supporting research on what may be the most effective programs.

Moreover, activities in many other states involve few behavior change strategies and programs, since program and policy staff frequently face more disincentives and barriers than they do incentives for pursuing these strategies. A number of preliminary recommendations are provided below with the goal of overcoming many, if not all, of the existing barriers to the implementation of behavior change strategies for energy savings. These recommendations are summarized in Table 1.

8.2 Recommendations

There are four categories of recommendation discussed in this section of the paper: (1) research and experimentation, (2) program implementation and savings attribution, (3) measurement and accountability, and (4) other valuable ideas to motivate policymakers and program staff to pursue energy-efficient behavior in a regulatory environment.

8.2.1 Research and experimentation: Efforts in the area of research and experimentation need to focus in four goals: the identification and quantification (where possible) of behavior-related energy savings, the development of a national research collaborative on the human dimensions of energy research, the development and application of new mental models, and the institutionalization of reinvention labs. Primary among the research-related recommendations is the need for a coordinated initiative to expand the base of recent and reliable knowledge with regard to effective approaches for achieving behavior-based energy savings:

- Research and experimentation to identify and quantify effective strategies, contexts, and populations
- National Collaborative Human Dimensions Energy Research Center
- New mental model
- Reinvention labs

An expanded research and experimentation initiative focused on behavior change strategies is needed in order to identify and assess effective strategies, contexts, and populations. Unfortunately, the existing body of research on behavior change strategies is best characterized as fragmented, dated, and of limited breadth and scope. This lack of research has left substantial and important gaps in the knowledge base and resulted in some notable hesitation to pursue behavior change. As long as these substantial information gaps remain, confidence in behavior-oriented approaches is likely to remain insufficient to inspire a new course of action.

[20] http://docs.cpuc.ca.gov/efile/RULC/94362.pdf

Table 1: A Summary of Perceived Barriers and Recommendations

	Perceived Barriers	Recommendations
Major Barriers	Limited Purview of Utility Regulators	An expanded purview and recognition of the importance of implementing behavior change strategies in order to meet or exceed: o Customer Satisfaction Goals o GHG Emissions Targets and Climate Change Imperatives o Energy Efficiency and Energy Savings Goals.
	Insufficient Knowledge and Experience Regarding Behavior Change Strategies (limited funds for research and lack of a coordinated research effort)	Increase the scale of research on the effectiveness and persistence of different behavior change strategies. Chart the size, scope, and characteristics of potential behavior-related energy savings. Establish a National Collaborative Research Center. Develop Reinvention Labs or other similar spaces that promote on-the-ground or in-the-field experimentation and innovation. Increase the number of staff with social science expertise, especially at senior levels.
	Rigid Organizational Structures and Cultures that Hinder Experimentation and Innovation	Establish or maintain a separation of oversight and implementation (steering and rowing) so as to provide increased flexibility to program implementers. Move toward portfolio-level savings evaluations. Develop reinvention labs that provide the means for on-the-ground or in-the-field experimentation and innovation. Increase the number of staff with social science expertise, especially at senior levels. Provide incentives to program staff for utilizing behavior change strategies. Establish organizational mechanisms for communicating information and sharing experiences between staff.
	Established Monitoring and Evaluation Methodologies that Favor Traditional Energy Efficiency Programs	Develop and implement new monitoring and evaluation methodologies that more accurately assess and attribute behavior-related energy savings. (We discuss logic models as one potential methodology.) Incorporate customer satisfaction into new monitoring and evaluation strategies. Use both quantitative and qualitative measures to evaluate program success. Establish longer evaluation cycles.

	Perceived Barriers	Recommendations
Minor Barriers	Imprecise Terminology and Lack of a Common Understanding	Establish a National Collaborative Research Center. Establish inter-organizational groups (such as CEE's Behavior Interest Group) and encourage staff participation so as to promote dialogue and discussion across organizations.
	Technology-Bias	Increase the number of staff with social science expertise, especially at senior levels. Provide incentives to program staff for utilizing behavior change strategies. Establish organizational mechanisms for communicating information and sharing experiences between staff. Develop and implement new monitoring and evaluation methodologies that more accurately assess and attribute behavior-related energy savings. (We discuss logic models as one potential methodology). Incorporate customer satisfaction into new monitoring and evaluation strategies.
Inherent Challenges of Behavior Change Strategies	Getting People's Attention	Applying an interdisciplinary social science, communications, and marketing approach to program design. Increase the number of staff with social science expertise, especially at senior levels.
	Recognizing and Addressing Diversity	Using innovative research insights to program design that include segmentation analysis. Increase the number of staff with social science expertise, especially at senior levels.
	Difficulty of Changing Established Values	Increase the scale of research on the effectiveness and persistence of different behavior change strategies and on how the values and worldviews of different segments of the population correspond to specific energy use patterns. Establish longer program and evaluation cycles.
	Fickle Nature of People	Increase the scale of research on the effectiveness and persistence of different behavior change strategies and on how the context and socio-demographic characteristics shape the persistence of energy savings.

A National Collaborative Research Center should be developed to expand the range of behavior-related energy research, facilitate the sharing of information, and promote the coordination of research agendas at the national level. A national-level research effort would expedite the research process and avoid the unnecessary duplication of research efforts, making a wider selection of information available in a shorter period of time. A national-level effort would also distribute the costs associated with building a comprehensive set of behavioral information. Such an effort should be more than an agreement to share research findings but should also involve the development of a common research agenda, the prioritization of that agenda, and the development of uniform research methods so as to ensure the comparability of findings and the ability to build a practical base of knowledge. Leadership, governance, and funding are open questions.

A new mental model of the behavior resource should be developed to establish the vision of the size and scope of potential behavior-related savings and recognize the importance of behavior change strategies in achieving these savings. The credibility of behavior change strategies could be dramatically enhanced through the establishment of reliable estimates of the size, scope, costs, and benefits of such strategies. Estimates of the scope and accessibility of potential behavior-related energy savings would reduce the perceived risks and uncertainties associated with their pursuit and motivate program and policy staff to consider behavior change strategies as a viable and reliable alternative to more traditional technology-based programs.

Some version of reinvention laboratories should be instituted within/among the utilities in order to create greater flexibility to develop knowledge and best practices associated with behavior change strategies. This type of approach would create a "safe space" and an agenda for the exploration of behavior change strategies and could reduce and distribute the risks of investing in the necessary research and development.

8.2.2 Program implementation and savings attribution: Efforts in the area of program implementation and savings attribution should focus on four key activities:

- Separating steering and rowing
- Mitigating the technology bias
- Applying logic models and similar tools
- Specifying and assessing progress toward medium and long-term objectives

Separating steering and rowing distinguishes between providing broad oversight and managing the day-to-day operations and planning associated with the implementation and evaluation of programs and policies. Unfortunately policymakers in many states get too involved in the details of *how* things get done, stifling creativity and innovation. Instead, policymakers should be concerned with setting clear goals, objectives, and standards for the organizations that they regulate, while program personnel should be focused on finding the best means of achieving those goals and objectives. While benchmarks are important for monitoring progress, they must be designed so as to avoid bias against behavior change strategies and programs.

Mitigating the technology bias within the utility and regulatory culture. New programs should be designed so as to lessen the technology bias that values energy savings associated with the

adoption of measures above other means of energy savings and assumes that those savings are more persistent and reliable. Importantly, this predisposition toward technology as the preferred means of achieving energy savings has become institutionalized in many energy-related programs via evaluation criteria that attribute energy savings to the installation of new equipment without giving adequate recognition to the ways in which behavioral factors are essential in enabling and maximizing (and/or undermining) potential savings. Awareness and education should be provided to recognize the importance of behavior and promote a more holistic approach among utilities and regulators.

Logic models should be used more frequently to raise the awareness of program personnel of the role that behavior plays in reducing energy consumption and to more accurately assess and attribute energy savings. Logic models provide a proven method for specifying the complex relationship between technology and behavior. They also provide a means for revealing the many ways in which the accomplishments of traditional (technology-focused) programs could be enhanced through efforts to consciously address their human dimensions. As such, logic models offer the means of:

- raising the general level of awareness of the role that behavior plays in achieving energy efficiency goals,
- mapping the complex causal structures that result in energy savings,
- testing theories of behavior change so as to build better programs in the future, and
- correctly attributing savings to various program inputs — whether technological, behavioral, or otherwise.

Specifying and assessing medium and long-term objectives. Programs and policies should be required to specify medium and long-term objectives and/or measures of sustainability. This will be aided by the increased use of program logic models, which require specification of intermediate steps. The sustainability of energy savings generally requires regular human intervention and, therefore, requires the recognition of behavioral elements over longer time periods.

8.2.3 Measurement and accountability: Efforts in the area of measurement and accountability should address three key changes:

- Portfolio level accountability
- Longer-term performance periods
- Quantitative and qualitative measure of consumer satisfaction

Portfolio level accountability. Regulatory agencies throughout the country should follow the examples of California and NYSERDA and take a more macro approach to ensuring energy savings, one that provides more leeway to utilities and program administrators by letting them determine the right program mix to achieve the desired energy savings targets. Portfolio level accountability is likely to encourage a greater mix of technology-based and behavior-based approaches. Nevertheless, it is important to recognize that while portfolio level accountability may facilitate the integration of behavior change strategies, it is not sufficient for achieving them alone. In order to be successful, portfolio level accountability must be combined with a broad

and concerted research effort that can provide current information to policymakers, program administrators, and implementers.

Longer-term performance periods. Like California and NYSERDA, state regulators should lengthen program and evaluation cycles to reduce the perceived risk associated with choosing new types of programs. There is little perceived risk associated with implementing the tried and tested programs with long histories of well-documented levels of energy savings. On the other hand, programs that are newer, less well tested, and with savings estimates that are less well defined are likely to be ignored when the program and evaluation cycles are short, since there is little time for learning and the adjustment of program strategies. Behavioral programs are likely to fall into the latter category and be given hesitant support. In addition, the success of behavior change programs is tied to their ability to successfully identify and target appropriate population segments. Sufficient time is needed to adjust to the complexities of working with a diverse population.

Quantitative and qualitative measures of consumer satisfaction. State agencies and utilities should assess the contribution of behavior change strategies in increasing overall levels of customer satisfaction using both quantitative and qualitative measures of consumer satisfaction. According to David Osborne (Osborne and Plastrik 2000), a fellow with the National Academy of Public Administration and a former advisor to Vice President Gore, a comprehensive evaluation system should include both qualitative and quantitative measures of customer satisfaction and service quality. In fact, Osborne suggests that customers should be actively involved in choosing performance indicators. Osborne's recommendations are based on the fact that qualitative measures provide a different kind of information that is likely to provide unique insights. For example, in the context of energy savings, qualitative measures are more likely to capture the non-energy benefits that are important to consumers.

8.2.4 Other valuable ideas: Two additional recommendations need to be mentioned:

- Hire more social scientists at all management levels — especially in senior and decision-making positions.
- Re-envision utility regulators purview

Social scientists in management. A greater proportion of social scientists should be hired at all levels within utilities and regulatory agencies. Currently, the limited number of social scientists is likely to dampen the demand for behavior change strategies. Without adequate representation, particularly in upper level positions and positions of influence, the insights from the social science community are unlikely to gain sway or be incorporated into policies and programs designed to reduce energy consumption. Without the influence of social scientists, cultural transformation within the techno-economic milieu of utilities is likely to be slowed.

Re-envision utility regulators purview. Utilities and regulators should consider an active role in assessing the scope of their purview, so as to reclaim leadership and invest in a broader scope of cost-effective activities, especially behavior change strategies. The CPUC and other stakeholders are free to determine how much money the utilities should spend on programs deemed to be prudent and cost-effective. A reasonable interpretation is that the utilities should

make all investments that have the potential to be cost-effective, including promising behavior change strategies. This is especially true in the case of California where IOUs are allowed to make non-cost-effective investments, if the portfolio as a whole is cost-effective.

In summary, changing some existing mind-sets and cultures will require research and education on the effectiveness of behavioral program interventions or complements. When promising program ideas emerge, regulators need to be willing to allow utilities to test them in the market, reward them for the effort, and allow them to fail (since we can learn a lot from failures). Eventually, the ambitious energy, climate, and economic goals of the California Energy Efficiency Strategic Plan (CPUC 2008) will require not only hardware but "humanware" in order to be achieved.

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Appendix A: Methodology

The ideas presented in this paper have primarily been distilled from three data sources: (1) in-depth interviews with twenty, well-seasoned energy efficiency experts with an average of 20–30 years working on energy and efficiency issues; (2) a discussion of the topic issues with energy professionals attending the 2008 ACEEE Summer Study; and (3) an online survey of 123 energy professionals.

In-Depth Interviews: a small sample of energy efficiency experts was identified using a snow-ball sampling method. ACEEE staff were used to identify the first round of potential interviewees. Interviewees were selected based on the number of years of experience working on energy and efficiency issues. The sample included people who were utility employees, as well as employees of nonprofit organizations, academic institutions, and private sector consultants. These individuals were contacted and all agreed to participate in an in-depth semi-structured interview. The interviews lasted from 30 to 90 minutes in length depending on the length of the answers and the level of detail provided. (See Appendix B for survey questions.)

Topic Roundtable Discussion: An informal roundtable session was held at the 2008 ACEEE Summer Study on Energy Efficiency in Buildings. Approximately 50 energy professionals attended the session and responded to issues and questions raised through the in-depth interviews. The roundtable session primarily served as a means of assessing the level of agreement among energy professionals with regard to identifying the most salient topics associated with the questions at hand. This information was then evaluated and incorporated in the design and development of the online survey.

Online Survey: Additional data were collected through the use of an online survey. Five hundred energy professionals from the states of California, New York, and Wisconsin were invited to participate in the online survey. While the survey sample does not represent a random sampling of energy professionals in these states, it does represent a diverse mix of energy professionals from utilities, public utility commissions, nonprofit organizations, and for-profit organizations working in the field of energy efficiency. The sample was heavily weighted to California. Roughly 80% of individuals who were invited to participate were from California. The final response rate was roughly 25%. The survey questions are included in Appendix B. A total of 123 energy professionals participated in the online survey. Additional information is presented in the following table.

Respondents by Type of Organization and State	**CA**	**NY**	**Other**	**n.a.**	**Total by Org Type**	**%**
Utility	76%	15%	40%		56	50%
Utility Commission	21%	8%	0%		12	11%
Nonprofit	0%	27%	40%		17	15%
For-profit and Other	0%	50%	20%		28	23%
Total by State	38	26	15	44	111	
n.a.					12	

Total respondents = 123
n.a. indicates those respondents who did not specify state or organization type.
Other includes respondents from Wisconsin, Massachusetts, and Florida.

Appendix B: Research Framework and Survey Questions

Motivating Policymakers, Program Administrators and Program Implementers to Pursue Behavioral Change Strategies

Overarching Questions:

1) Is it more difficult to pursue behavior in a regulatory versus non-regulatory environment?
2) How so?/Why?
3) What might be done to motivate policymakers, program administrators, and implementers to pursue energy efficiency behaviors?

Approach:

Identify several utilities in regulatory versus non-regulatory environments in 2-4 geographical areas of the country for a comparative study. (California + other states to be determined) Study will consider only those working in a regulatory environment. [Yet to determine: variables for comparison, i.e. different evaluation criteria, different regulatory structures, etc]

An initial Delphi survey of experts will interview a total of 14-20 individuals from utilities, utility commissions, and program implementing organizations to establish information on the range of 1) *barriers*, 2) *incentives*, 3) *mechanisms*, 4) *behavior-oriented programs*, and 5) *motivational structures* currently encountered by program administrators and implementers.

Delphi Survey topics/questions:

1. Let's begin with a question about achieving energy efficiency broadly speaking. Could you characterize the approaches or types of programs that you think are the most effective at achieving energy efficiency?

2. How much ***support*** would you say there is within your organization for programs that use behavior change strategies as a means of achieving energy efficiency?

3. Some people think of behavior-oriented programs as ***ineffective***. Is that a perception that you or others in your company or organization share? [Why or why not?]

4. Does your organization currently administer or encourage policies or programs that pursue behavior change strategies? [If YES, could you provide ***some examples of policies or programs that incorporate behavior change strategies***?]

5. Could you specify what behavior change means to you?

YES

1. With regard to the use of behavior change strategies by your organization, would you say that:
   a) There are currently ***too many*** behavior-oriented programs,
   b) There are ***too few*** behavior-oriented programs, or
   c) There is ***roughly the right amount*** of behavior-oriented programs?

2. What would you characterize as the most "typical" approach to behavior change?

3. To what degree do the programs that you (or your organization) work on align with the "typical" approach to behavior change?

4. In general, what would you say are some of the ***strengths*** of using behavior change strategies?

5. What ***problems or weaknesses*** have you (or other people you know) encountered with behavior-oriented programs?

6. Do you think there might be certain ***barriers*** that dissuade people from pursuing behavior change strategies?

7. What kinds of ***motivational structures or system of incentives*** do you know of that currently might encourage program and policy staff to pursue behavior change strategies?

8. Could you imagine ***a more effective means of motivating program*** and policy staff to pursue behavior change strategies?

9. How are behavior-oriented efforts typically monitored and evaluated? Is this different from the approaches use for non-behavior-oriented types of programs?

10. What ***other types of changes*** do you think could be made in order to increase the number of behavior change strategies pursued, implemented or supported within the energy efficiency community?

- Are there ***other people*** *[at your organization or otherwise**]*** who you would recommend that I talk to?

- *Follow up with a **short on-line survey**:*
  The next step in this research will be to take the information gathered here to identify a small set of target issues and then put together a simple online survey to capture a broader set of responses. Is there a particular person at your organization that might provide me with a list of potential participants from [name of organization]?

- I'm also taking this opportunity to gauge people's interest in participating in a ***national collaborative behavioral research program.*** The program would be geared toward identifying cost-effective, behavioral approaches to closing the "efficiency gap". Does this sound like something that your organization might be interested in?

- ***Summer Study: Informal Session: Invitation***
  Thursday, August 21st from 2:00 to 4:00 pm.

NO

1. What would you characterize as the most "typical" approach to behavior change?

2. In general, what would you say are some of the ***strengths*** of using behavior change strategies?

3. What ***problems or weaknesses*** have you (or other people you know) encountered with behavior-oriented programs?

4. Do you think there are certain ***barriers*** that dissuade people from pursuing behavior change strategies?

5. What kinds of ***motivational structures or system of incentives*** do you know of that encourage program and policy staff to pursue behavior change strategies?

6. Could you imagine ***a more effective means of motivating program*** and policy staff to pursue behavior change strategies?

7. What ***types of changes*** do you think would be effective at increase the number of behavior change strategies pursued, implemented or supported within the energy efficiency community?

- Are there ***other people*** *[at your organization or otherwise**]*** who you would recommend that I talk to?

- *Follow up with a **short on-line survey**:*
  The next step in this research will be to take the information gathered here to identify a small set of target issues and then put together a simple online survey to capture a broader set of responses. Is there a particular person at your organization that might provide me with a list of potential participants from [name of organization]?

- I'm also taking this opportunity to gauge people's interest in participating in a ***national collaborative behavioral research program.*** The program would be geared toward identifying cost-effective, behavioral approaches to closing the "efficiency gap". Does this sound like something that your organization might be interested in?

- ***Summer Study: Informal Session: Invitation***
  Thursday, August 21st from 2:00 to 4:00 pm.

The results of the survey will be used to enhance our understanding of the issues of concern, identify motivating factors, and to develop a short, closed-ended survey that will be administered to a larger sample of respondents. Additional information will be collected via an informal session at ACEEE's summer study.

The final report will be written based on insights gained through both surveys and will also include a more general discussion regarding the integration of behavior, technology and economy in programs and policies. We are currently working to finalize our list of experts and the questions for the expert survey.

Summer Study Session

Achieving the Next Level of Energy Efficiency Savings: How to Maximize Savings by Encouraging Behavior-Based Programs and Innovation

Karen Ehrhardt-Martinez and Skip Laitner

Thursday, August 21
2:00 PM - 4:00 PM

A recent study by the American Council for an Energy-Efficient Economy suggests that efforts to increase energy efficiency could potentially reduce future energy consumption by 25 to 30% by 2030. Achieving these potential savings will require the diffusion and adoption of a wide variety of existing technologies. However, human behavior will also play a critical role in ensuring that potential energy efficiency savings will be accomplished. Without concentrated attention to the behavioral aspects of efficiency programs, it is unlikely that maximum savings will be achieved. In other words, behavior based programs are a necessary element in enabling both technological and non-technological sources of energy savings. In addition, new innovations could open the door to as yet unanticipated savings, if the human capacity for innovation is suitably encouraged. In other words, programs geared toward catalyzing the development of new technologies could provide the possibility of amplifying future efficiency savings.

This session will explore the benefits of behavior-oriented and innovation-focused programs for maximizing and extending future efficiency gains. Discussion topics will include:

- To what extent are behavior-oriented programs being used to reduce energy consumption in both regulatory and non-regulatory environments?
- How successful have behavior-oriented programs proven to be?
- What factors have encouraged/discouraged policymakers, program administrators, and implementers to pursue energy efficiency behaviors?
- What additional changes could be recommended to remove barriers and encourage the use of behavior-based programs?
- Which programs and policies have been most successful in promoting new technology and/or market-based innovations?

Online Survey on Behavior Programs and Policies

Your insights are highly valued!

Please answer each of the following questions as completely as possible. Individual responses will be kept strictly confidential.

The survey contains 19 questions and takes approximately 10-15 minutes to complete.

1. Among the different types of approaches that are used for reducing energy consumption are programs that pursue behavior change. Which of the following types of approaches would you identify as an approach that pursues behavior change? (mark all that apply)

☐ Those that educate consumers about general energy consumption patterns, energy efficiency, or other general aspects of energy use.

☐ Those that suggest changes in everyday energy use habits or practices.

☐ Those that provide consumers with specific information about their specific energy consumption practices.

☐ Those that provide consumers with rebates or other economic incentives so as to reduce energy consumption and/or to increase energy efficiency.

☐ Those that encourage the purchase of more energy-efficient technologies, products, or equipment.

☐ Those that encourage lifestyle changes.

☐ Other types of approaches (please specify)

2. How much interest would you say there is within your organization in promoting or administering programs that pursue behavior change as a means of reducing energy consumption?

1. A very large amount of interest
2. A large amount of interest
3. A fair amount of interest
4. Not much interest
5. No interest
8. Don't Know
9. Not applicable

3. To what degree does your organization currently administer or encourage policies or programs that pursue behavior change?

1. All of the programs/policies that we promote or administer include behavior change strategies

2. Nearly all of the programs/policies that we promote or administer include behavior change strategies
3. More than half of the programs/policies that we promote or administer include behavior change strategies
4. Approximately half of the programs/policies that we promote or administer include behavior change strategies.
5. Less than half of the programs/policies that we promote or administer include behavior change strategies
6. Only a few of the programs/policies that we promote or administer include behavior change strategies.
7. None of the programs/policies that we promote or administer include behavior change strategies.
8. Don't Know
9. Not applicable

4. With regard to the pursuit of behavior change by your organization, would you say that:

1) there are currently ***too many*** behavior-oriented programs,
2) there are ***too few*** behavior-oriented programs, or
3) there is roughly the right amount of behavior-oriented programs.

Why? _____

5. What type of organization do you work for?

- Utility
- Utility Commission
- National Lab
- Nonprofit Organization
- Other (please specify)

6. How much interest would you say there is within the energy efficiency community more broadly for programs that pursue behavior change as a means of reducing energy consumption?

1. A very large amount of interest
2. A large amount of interest
3. A fair amount of interest
4. Not much interest
5. No interest
8. Don't Know
9. Not applicable

7. Of the programs that pursue behavior change that you or others in your organization have worked on, approximately what PERCENT would you estimate include efforts to:

	Percent
Educate consumers about general energy consumption patterns, energy efficiency, or other general aspects of energy use?	
Suggest changes in everyday energy use habits or practices?	
Provide consumers with specific information about their specific energy consumption practices?	
Provide consumers with rebates or other economic incentives (such as special rate designs, cash incentives based on usage reduction, etc) so as to reduce energy consumption and/or increase energy efficiency?	
Encourage the purchase of more energy-efficient technologies, products, or equipment?	
Encourage lifestyle changes?	
Other approaches? (indicate percent "other")	

Other approaches include:

8. Please rank the following list of CONCERNS by marking the number 1 next to the concern that you believe represents the largest CONSTRAINT to the pursuit of behavior change, the number 2 next to the second largest constraint and so on.

	1	2	3	4
Lack of persistence of behavior-related savings over time.		2	3	4
Inability to quantify behavior-related energy savings.	1	2	3	4
Incompatibility of existing measurement methodologies.	1	2	3	4
Lack of money or financial resources for these types of efforts.	1	2	3	4
Lack of interest in pursuing behavior strategies.	1	2	3	4
No constraints.	1	2	3	4
Other...	1	2	3	4

9. Please rank the following list of STRENGTHS by selecting the number 1 for the item that you believe represents the most important BENEFIT of pursuing behavior change, the number 2 for the item that you believe represents the second most important benefit and so on.

	1	2	3	4
The untapped energy-savings potential associated with changes in behavior.	. 1	2	3	4
The ability to accelerate the pace of change in energy consumption through changes in behavior.	1	2	3	4
The ability to reduce the likelihood or scale of a subsequent rebound in energy use by changing behavior.	1	2	3	4
The ability to provide consumers with low-cost or no-cost options for reducing their energy consumption.	1	2	3	4
Other...	1	2	3	4

10. What are the two or three main difficulties or barriers faced by POLICYMAKERS who are interested in encouraging or implementing policies or programs that pursue behavior change in a regulatory environment?

11. What are the two or three main difficulties or barriers faced by PROGRAM ADMINISTRATORS who are interested in encouraging or implementing policies or programs that pursue behavior change in a regulatory environment?

12. What are the two or three main difficulties or barriers faced by PROGRAM IMPLEMENTORS who are interested in encouraging or implementing policies or programs that pursue behavior change in a regulatory environment?

13. What are the two or three most effective approaches for motivating POLICYMAKERS to pursue behavior change in a regulatory environment?

14. What are the two or three most effective approaches for motivating PROGRAM ADMINISTRATORS to pursue behavior change in a regulatory environment?

15. What are the two or three most effective approaches for motivating PROGRAM IMPLEMENTORS to pursue behavior change in a regulatory environment?

16. In order to assess differences in organizational, occupational, and regional perspectives, please provide the following demographic information. Please note that demographic

information will only be used to aggregate responses. As such, individual responses and respondents will be kept confidential.

Name:

Company/Organization:

Address:

Address 2:

City/Town:

State:

ZIP/Postal Code:

Email Address:

Phone Number:

17. How many years have you been working on energy-related issues?

18. Current title:

19. Current program:

Thank you for your participation!

If you have any questions or comments, please contact:

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