VISIBLE AND CONCRETE SAVINGS: CASE STUDIES OF EFFECTIVE BEHAVIORAL APPROACHES TO IMPROVING CUSTOMER ENERGY EFFICIENCY

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GLOSSARY

Advanced Metering Infrastructure (AMI): See ACEEE Glossary.

Behavioral Program (as defined in this report): At some level, any type of energy efficiency program involves intervention to influence participant behavior. Even a standard rebate program is directed at influencing customer purchase behavior. The distinction we draw for this report is to focus on programs and interventions designed to influence ongoing individual and/or organizational behavior and habits, rather than discrete one-time behaviors such as equipment purchases. This review covers both information and everyday energy use habits, but does not focus on policy decisions, one-time purchases, or the choice to participate in energy efficiency programs.

British Thermal Unit (Btu): See ACEEE Glossary.

Capital Projects: A major project, often involving building work, which will make it possible for an organization to increase its production. (source: Macmillan).

Community-Based Social Marketing (CBSM): A pragmatic alternative to information-intensive education campaigns. This approach involves: identifying barriers to a sustainable behavior, designing a strategy that utilizes behavior change tools, piloting the strategy with a small segment of a community, and finally, evaluating the impact of the program once it has been implemented across a community (source: http://www.cbsm.com, a site which promotes this approach and explains how to accomplish it).

Continuous Improvement: Continuous improvement is one of the tools that underpin the philosophies of total quality management and lean production. Through constant study and revision of processes, an organization can manufacture a better product at a reduced cost (source: BNet).

Control Group: See ACEEE Glossary.

Demand Response: See ACEEE Glossary.

Energy Conservation: See ACEEE Glossary.

Energy Intensity: The ratio of energy consumption to a measure of the demand for services (e.g., number of buildings, total floor space, floor space-hours, number of employees, or constant dollar value of Gross Domestic Product for services) (source: EIA). In industrial production, in this report, it is measured as the energy use per unit weight of manufactured goods.

ENERGY STAR®: See ACEEE Glossary.

Feebate: See ACEEE Glossary.

Feedback: In an energy efficiency context, feedback is information that energy users see about their activities (usually via utility billing, metering, etc.). This information can be used in education and behavior change programs.

Focus Group: A focus group is a qualitative research practice in which researchers ask a group of people about their perceptions, opinions, beliefs, and attitudes about a product, service, advertisement, idea, etc. The questions are asked in an interactive group setting where participants are free to talk with other group members (source: Wikipedia).

Investor-Owned Utility (IOU): See ACEEE Glossary.

ISO-9000: A family of standards and guidelines for quality in the manufacturing and service industries from the International Organization for Standardization (ISO). ISO 9000 defines the criteria for what should be measured. ISO 9001 covers design and development. ISO 9002 covers production, installation, and service, and ISO 9003 covers final testing and inspection. ISO 9000 certification does not guarantee product quality. It ensures that the processes that develop the product are documented and performed in a quality manner (source: PC Magazine).

ISO-14000: After the success of the ISO 9000 series of quality standards, the International Standards Organization published a comprehensive set of standards for environmental management. This series of standards is designed to cover the whole area of environmental issues for organizations in the global marketplace (source: http://www.quality.co.uk/iso14000.htm).

Kilowatt-Hour (kWh): See ACEEE Glossary.

Labor Intensity: Labor intensity is the relative proportion of labor (compared to capital) used in a process (source: Wikipedia).

Market Segmentation: A marketing term referring to the aggregating of prospective buyers into groups (segments) that have common needs and will respond similarly to a marketing action (source: Investopedia).

Megawatt-Hour (MWh): See ACEEE Glossary.

Peak Demand: See ACEEE Glossary.

Pre-Test/Post-Test: Pre-test/post-test designs (a kind of quasi-experiment) are often used to calculate the difference between energy use before and after the installation of equipment to estimate program impacts (source: Sullivan 2009).

Ratepayer Impact Measure (RIM) Test: See ACEEE Glossary.

Sector: An area of the economy in which businesses share the same or a related product or service (source: Investopedia.com).

Smart Grid: An advanced electricity transmission and distribution network ("grid") that uses digital information, communications, and control technology to improve reliability, security, and efficiency. (Adapted from: Mondaq. *United States: Glossary of Key Climate Change Terms.* http://www.mondaq.com/unitedstates/article.asp?articleid=87596).

Smart Meter: See ACEEE Glossary.

Social Marketing: See ACEEE Glossary.

Social Norms: See ACEEE Glossary.

Societal Cost Test: See ACEEE Glossary.

Therm: 100,000 Btu. A unit of energy generally used for reporting natural gas use.

Time-of-Use Rates (TOU): See ACEEE Glossary.

Total Resource Cost (TRC) Test: See ACEEE Glossary.

Uptime: The time when a machine is working (source: Macmillan).

Utility Cost or Program Administrators Cost (PAC) Test: See ACEEE Glossary.

Weatherization: See ACEEE Glossary.

EXECUTIVE SUMMARY

Behavioral programs that seek to reduce customer energy use are attracting increased interest as governments, industry, and the public scale up their energy efficiency efforts to reduce carbon emissions and accomplish numerous other environmental and economic goals. Historically, quantifying the energy savings resulting from "behavioral" programs accurately has been difficult. Published data showing these savings have been relatively limited, despite the appeal and potential of using behavioral approaches to improve the effectiveness of customer energy efficiency programs.

This study provides selected examples of successful behavioral programs. The programs profiled here report a wide range of savings and use a wide range of technologies, measures, and program designs.

Behavioral programs can also provide significant non-energy benefits for individuals and organizations. For example, Building Operator Certification programs provide professional credentials to building operators, making their trade a more skilled occupation and increasing their job opportunities.

Energy efficiency program developers are seeking best practices for behavioral programs. Effective evaluation can demonstrate how behavioral measures perform. This report provides case studies on some of the leading behavioral programs offered and evaluated to date.

Defining the Focus of this Report

When framing the focus of this report, it is important to clarify what we mean by "behavioral programs." At some level, any type of energy efficiency program involves intervention to influence participant behavior. Even a standard rebate program is directed at influencing the customer purchase behavior. The distinction we draw for this report is to focus on programs and interventions designed to influence ongoing individual and/or organizational behavior and habits that affect energy use, rather than discrete one-time behavior such as equipment purchases.

Programs Profiled

This report profiles a selected set of leading examples[1] of behavioral energy efficiency programs in the industrial, buildings and utilities, and transportation sectors. These programs took place between 2000 and 2010; included over 100 participants each; collected data for over a year; and provided models for other programs to build upon. The programs here use a wide range of technical and social science approaches to encourage energy-efficient behavior. We outline these differences in detail in the Program Design section. We describe current program designs and cite other resources for program developers.

After substantial research, we selected 10 programs to profile. These programs are summarized in Table 1.

[1] The programs profiled here are not intended to be representative of all programs of these types. They were selected as leading examples with publicly-reported savings.

Table 1. List of Case Studies

Number	Sector	Program	Brief Program Description and Findings
1	Buildings and Utilities	Building Operator Certification Program (Kansas City Power & Light)	The BOC program is now offered in 22 states throughout the country. Graduates of the Kansas City program saved an estimated 9.2 million kWh of electricity and 35,000 therms of gas while reducing demand by 2,300 kW.
2	Buildings and Utilities	Residential Smart Energy Monitoring Pilot (Cape Light Compact and GroundedPower)	This program used data from in-home energy monitoring systems; customers viewed the feedback and tips online. On average, participants reduced their energy use by 9.3 percent (compared to a blended control group).
3	Buildings and Utilities	Flex Your Power	Flex Your Power was a statewide media and outreach program. Some of Flex Your Power's main successes were its brand recognition, its ability to reach Spanish speakers, its collaboration with rural community-based organizations, its research-based message development, and its online presence.
4	Buildings and Utilities	Home Energy Reporting Program (Sacramento Municipal Utility District and OPOWER)	This program shows customized energy reports using a social norms approach can be an effective means of reducing energy demand; in this case, by ~2.4 percent over a 16-month period.
5	Buildings and Utilities	M-Power Program (Salt River Project)	In fiscal year 2009, nearly 78,000 customers participated in this pay-as-you-go utility program. In 2009, households reduced their energy use by 12 percent, on average.
6	Buildings and Utilities	Real Time Monitoring Pilot (Hydro One)	The program used informational rather than marketing strategies. Evaluators reported an average energy savings of 6.5 percent.
7	Industry	Make an Impact Initiative (Alcoa)	This initiative raises employee awareness that energy and water efficiency is part of the solution to climate change. The company reports that it has prevented the emission of 4 million pounds of carbon dioxide through this program.
8	Industry	Corporate Energy Management (The Dow Chemical Company)	In 1995, Dow decided to reduce its energy intensity per pound of product by 20 percent by 2005. When they reached that goal, they set an even more ambitious goal: an additional 25 percent reduction by 2015. So far, the program has saved the company $8.6 billion.
9	Transportation	SmartWay Transport Partnership (United States Environmental Protection Agency)	This public-private partnership reduces the impact of freight transportation on the environment, minimizes air pollution, and improves efficiency. The program has saved 1.5 million gallons of diesel and removed 14.7 million metric tons of carbon dioxide from the atmosphere (compared to a projected baseline).
10	Transportation	Feebate (France)	This program was intended to shift the car market in two ways: by motivating manufacturers to produce more efficient vehicles and by motivating consumers to choose them. The feebate program decreased the average energy consumption of vehicles sold by at least 3 percent.

Results

One reason to make tracking the results of behavioral programs a high priority is that these programs can deliver significant savings (as shown in the table above), although the range of savings varies widely. Data and analyses of these types of programs are still somewhat limited—especially for programs designed and implemented since 2000,[2] programs that span multiple years, and/or programs with relatively large customer populations. In general, we found that programs are using some behavioral science methods, but could greatly expand and refine their use of these techniques.

We selected programs that were relatively large (either spanning large organizations or including many individual participants). Therefore, the program models in this review may be suitable for replication across comparably large customer populations or large organizations with similar characteristics. In some cases, smaller programs can achieve very high rates of savings, but these technologies may not always be practical for larger-scale programs. The programs we selected illustrate a range of approaches and provide concrete examples of results that behavioral approaches to customer energy use can achieve.

Opportunities and Challenges

Because of the short timescale of many new energy efficiency goals and the rapid growth of utility behavioral programs, organizations may lack time for extensive experimentation. Although some effective practices based on social science and management are already in use, more research is urgently needed to expand the scope of these measures and test their effectiveness. Research reports sponsored by the California Institute for Energy and Environment have proposed streamlined methods of program development and evaluation. Although reducing the delay between research and large-scale implementation is essential, demonstrating effectiveness through quality evaluation is the only way to assure that programs deliver real energy savings.

Fortunately, new technologies are entering the field and can facilitate behavioral programs' growth and success. Smart grid development can facilitate energy efficiency in all of the sectors covered in this report—industry, buildings and utilities, and transportation. Although smart grid technology has many other potential uses (including improving energy reliability and opening the door to renewable energy generation), advanced metering can also inform residential, industrial, and commercial customers about their energy use and provide customers options for managing their energy use through advanced communications and control technologies.

Optimally, utilities can combine metering with attention to both financial and non-economic customer benefits. The Flex Your Power program used non-economic benefits to promote energy efficiency; its choice of which benefits to emphasize was based on market research.

Behavioral approaches to customer energy efficiency present a challenge to the energy efficiency field. The level of interdisciplinary communication, mutual understanding, and ability to match solutions to audience concerns requires everyone involved—whether their backgrounds are in social science, economics, engineering, marketing or other fields—to step beyond their zones of professional experience and work together to develop practical solutions. For energy professionals with engineering and economics backgrounds, the challenge lies in understanding how to increase program effectiveness by using marketing principles to make information persuasive, audience-oriented, and relevant. For energy professionals with marketing or social science backgrounds, the challenge lies in matching behavioral work to technological and economic choices while improving program evaluation to produce more concrete data for regulators, program managers. and related stakeholders.

[2] For a comprehensive review of over 50 residential studies regarding using feedback to influence behavior and energy use spanning 30 years, see Ehrhardt-Martinez, Donnelly and Laitner (2010).

To integrate marketing insights with existing efficiency program experience, it is essential to make both energy use and program results both concrete and visible. Making energy use more visible can advance behavioral change; similarly, reporting program results in terms of energy saved can increase the credibility of these programs in the eyes of decision makers and the public.

Recommendations

While this report presents a small, diverse group of case studies, our review yielded a set of recommendations that we believe will benefit the development, design, and implementation of similar energy efficiency programs. Our main recommendations are related to each other: we need to both understand the relationships between behavior and energy use, and quantify program results accurately. The latter is crucial for evaluating existing programs and estimating probable impacts from future programs.

Energy Visibility

Increasing the visibility of our energy use behavior can facilitate changes that yield greater energy efficiency and otherwise reduce energy use. Increasing visibility means putting the evidence “front and center" through some type of visual display—the equivalent of an auto dashboard that displays how much fuel remains in one’s gas tank.

Because the convenience of accessing energy makes it easy to use it without knowing how much one is spending, even simple visual reminders, without other behavioral measures, can lead to savings. The in-home display program by Hydro One described in this report took this approach and reported an average savings of 6.5 percent. In the transportation sector, Ford Motor Company is introducing a real-time fuel use readout technology that will have a similar function.

Social Context

Social environments can have a large influence on energy use by individual customers. Knowing what social norms influence their decisions, what social networks allow them to influence others, and what sources they consider credible can change the approaches efficiency programs take. This can eliminate wasted effort and readjust program approaches to match the social realities of energy use. OPOWER has used social norms extensively in their advanced billing programs, with positive results. GroundedPower and Cape Light Compact combined several social approaches in designing their program, including a Web site feature that encouraged participants to educate each other.

Corporate Culture

Companies build their industrial programs in alignment with their existing corporate structures and cultures. In large industrial contexts, designing programs to fit into existing software or quality assurance processes makes sense, both practically and financially. Energy efficiency becomes a core element of how the company works, rather than an add-on. These programs also track their financial performance rigorously, although they may not publish the results.

In industrial settings, researchers from other fields may find that there is a considerable learning curve in getting to know their audiences. What works in a company may not be at all similar to what works in an academic research project. Learning industrial terms and expectations is part of this communication process. Firms need to align energy objectives with other key objectives such as productivity, financial performance, and product quality.

Experimental Design

Well-designed pilot programs can identify and quantify causes and effects, including the effects of social science and marketing interventions. Knowing both which measures are working and why they are working can strengthen program design.

Researchers should use caution regarding extrapolating the results of small-scale programs to large-scale pilots, since the program designs may differ. For example, although a program can achieve high savings by metering every appliance in a customer's home, this is neither cost-effective nor straightforward to do on a larger scale (although that may change in the future). Similarly, small-scale pilot projects frequently rely on volunteers and "early adopters," who tend to be better informed about efficiency and more motivated to save energy than the population at large.

Conducting larger-scale, longer-term, randomized, scientifically-designed pilots and linking program design to implementation can address these issues. If programs do not identify cause-and-effect relationships through scientific experimental design, there is a risk that, when it is time to revise a program design, evaluators will not have enough data to make informed recommendations. Longer-term studies are also critical, since they could assure that significant savings persist and would allow program developers to forecast any expected decreases in energy savings.

Measurable Goals

Setting measurable goals for media campaigns and other outreach programs—and tracking energy savings and other specific behavioral changes—can demonstrate how these programs contribute to energy efficiency portfolios. A program in Vermont, the New Bulb in Town media campaign, measured the change in customers' intentions to buy CFLs and found that their interest increased.

Relevant Benefits

Moving beyond the frequently-stated economic and environmental reasons to save energy can benefit efficiency programs in the long run. Knowing what benefits matter enough to customers for them to change their habits—and what barriers prevent them from doing so—allows programs to conserve their own resources of time and energy by selecting strategies that will speak to their audiences.

Although some customers are already curious about their energy use, this may not always be true. Even in industrial settings, where financial motivations are crucial, improvements in work flow, employee interaction and morale can go beyond the economic benefits programs achieve. Salt River Project has consistently reduced the barriers for customers to participate in the M-Power program. At the same time, the utility has promoted the program's many non-financial benefits. User-friendly software and technology is essential to this process. EPA's SmartWay program serves freight carriers by providing reliable information on the efficacy of new energy-saving products and technologies. This encourages small companies, in particular, to invest in efficiency equipment.

Competitions, Status and Recognition

Competition and recognition can increase participation and commitment to energy efficiency efforts. Two programs we profiled offered recognition for energy efficiency accomplishments. Building Operator Certification opens doors for skilled trade professionals to move into more satisfying jobs; part of this job satisfaction comes from saving energy. The federal SmartWay program provides recognition to top-performing partners in the freight trucking industry.

Community-based programs and media outreach are sometimes integrated with energy competitions. The Energy Smackdown, a TV show, is one example. Public recognition projects for saving energy have been quite innovative; there has even been an energy efficiency trivia show. Quantifying the results of these activities can be complex, but programs could use an approach similar to the one that Efficiency Vermont's CFL campaign used. The evaluators of this campaign asked focus group participants about their plans to purchase CFLs and compared their responses before the media campaign with their responses afterward.

Social status considerations may reduce public interest in energy efficiency. What is the difference between a solar panel and a smart meter? People standing outside a building can see a solar panel;

the solar panel is also a sign of social status. Hanging a clothesline in the same place, although it is an energy-saving action, would not lead to the same response. Programs could use behavioral strategies to address this issue by offering ways for people to save energy that are visible and attract attention. These options would supplement, but not replace, existing efficiency measures.

Social Science Approaches

Making greater use of social science can benefit energy efficiency as a field. However, we should not lose sight of the need for accurate, reliable evaluation of behavioral programs—as well as for behavioral approaches to be used in other types of energy efficiency programs. This is an area that is ripe for innovation; there are many challenges and opportunities. There is still extensive work to be done in integrating behavioral science with efficiency programs and quantifying the results of these new program features accurately.

Conclusion

Behavior change has the potential to expand energy efficiency's reach at the state and national level. There is a large resource of energy savings that remains untapped. Improving evaluation, drawing on social science tools and techniques, and identifying causes and effects can help us reach beyond previous expectations and set higher goals. There is still a long way to go before programs access this potential fully.

Social science insights are applicable to all energy efficiency programs and can improve program design, make programs more efficient, and expand public interest and participation. Matching energy efficiency measures to the practical realities of energy use can make programs more effective. Including behavioral approaches can expand the reach of efficiency programs and improve their accuracy. As these examples show, to achieve greater energy savings through energy efficiency, we need to design and build programs that change habits as well as light bulbs.

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METHODOLOGY

Our goal in assembling this collection of case studies is to highlight areas for potential growth of behavioral approaches to improve energy efficiency by presenting some effective program models. These programs may provide a starting point for future work.

Defining the Focus of this Report

Practical experience, rather than theory, laid much of the groundwork for energy efficiency programs in the United States (Lutzenhiser et al. 2009). Although research on energy-efficient behavior can cover the entire spectrum of energy-related choices (including policy decisions and appliance purchases), a 2008 survey by Ehrhardt-Martinez shows that energy professionals define the term more narrowly (Skumatz, Khawaja & Colby 2009; Ehrhardt-Martinez, Laitner & Keating 2009). Although definitions of "behavior" vary in this field, the survey results showed that:

…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 percent) and those that provide consumers with targeted information about their specific energy consumption practices (83 percent) (Ehrhardt-Martinez, Laitner & Keating 2009: 6).

We used this definition to determine the scope of this report. This review covers both information and everyday energy use habits, but does not focus on policy decisions, one-time purchases, or the choice to participate in energy efficiency programs.[3] Here, we review some leading programs that focus on changing the ongoing actions or habits of the end-users of energy and can lead to measurable energy savings. These programs may include practices based on social science research, field experience, or a combination of the two.

The broad spectrum of programs that address ongoing actions includes, but is not limited to:

- informational programs
- media campaigns (including Web-based outreach)
- partnerships with community organizations
- Community-Based Social Marketing
- group competitions
- awards, certifications, and public recognition for saving energy
- improved billing, customer data tracking, and feedback systems
- Web-based tools for customers
- commercial and industrial operations improvements

Behavior change in industrial organizations differs from that of other types of energy customers. Industrial organizations do not use the term "behavioral" to describe their programs. In this sector, "corporate energy management" initiatives and "employee awareness programs" perform similar functions. These programs are designed to accomplish similar goals to programs in other sectors and are often quite effective at doing so. Rather than drawing on social science literature or energy efficiency field experience, they are based on best practices in industrial management. These programs are typically held to stringent cost-effectiveness requirements within the framework of overall corporate financial objectives and investment criteria.

Choosing Case Studies

This review profiles a subset of current and recent behavioral programs. All of these programs are relatively recent (post-2000). We gave preference to programs that:

[3] We did include one case study that addresses single purchase decisions, the French Feebate program for automobiles. We discuss our reasons for this slight exception in the section on Choosing Case Studies.

- Provided evidence of both cost-effectiveness and (proportionally) significant energy savings
- Took place in the United States or Canada
- Showed potential for larger-scale adoption
- Provided evidence that savings persisted beyond 12 months
- Were evaluated by third parties
- Reported "cause and effect" results for specific measures
- Had energy efficiency objectives or reported energy savings

We made several exceptions to these requirements. These exceptions, described below, merited coverage, but did not fully meet the criteria above.

We included Flex Your Power, a media and outreach program from California, due to its track record of significantly increasing enrollments in utility programs. Flex Your Power stopped promoting utility programs in 2004 after an unexpected surge in program enrollments. After 2004, Flex Your Power became a general awareness program and did not report energy savings (ODC 2008).

France's feebate program for vehicle purchases—a combination of a rebate for low-emitting vehicles and a fee for high-emitting vehicles—relies on a one-time customer choice rather than a repeated action. However, vehicle choice is such an important of element of transportation energy efficiency, and one so heavily influenced by consumer attitudes, that we thought it valuable to include a program of this type.

This report is a snapshot of a set of leading programs; it is not a ranked comparison similar to the annual ACEEE "Scorecard" reports. Also, this is not a comprehensive review of all programs that were active between 2000 and 2010. We weighted the selection process toward including a diverse set of programs rather than ranking the programs by their performance. This allowed us to highlight some less publicized programs. Ehrhardt-Martinez, Donnelly & Laitner (2010) provide a meta-review of over 50 programs spanning over 30 years.

Other innovative "programs to watch" that we did not profile in full appear as examples throughout the report. Also, some new types of behavioral programs, such as Web-based energy efficiency games, lack published data so far. We look forward to seeing the results of these programs.

PROGRAM DESIGN

In reviewing this set of programs, we saw some common ground in their successful strategies, but were also struck by the variety of program design approaches we observed. Behavioral programs vary across many dimensions. Here, we outline some of their differences in the areas of technology, social science. and program design.

Social Science Variables

Social scientists have studied the factors that change behavior and decision making for many years (Roberts 2010). Much of this research has not yet made its way into energy efficiency program development, except through overlapping areas of expertise such as business management. Some programs may not use these principles at all. One set of variables in a conceptual model for behavior change programs might cover how these programs use social science research (whether intentionally or coincidentally).

A series of white papers commissioned by the California Public Utilities Commission and published by the California Institute for Energy and Environment (CIEE) reviewed behavioral theories from multiple fields including anthropology, sociology, economics, and marketing. A full explanation of these theories would extend far beyond the scope of this report; for more information, see the CIEE Web site at http://uc-ciee.org/pubs/ref_behavior.html.

Why should energy efficiency programs reach beyond familiar economic, technical, or environmental considerations to learn what social scientists are doing? In one word, the answer is—efficacy. Social science can work both as an addition to program portfolios and as a means of retooling existing programs. As governments, regulators, and businesses "raise the bar" for efficiency, we can use behavioral tools to give states and utilities a "jump start" toward reaching their new goals. We can also use behavioral ideas to retool existing programs to broaden and deepen their reach. For example, applying behavioral methods to ridesharing programs could expand their influence significantly.

Are existing behavioral programs effective? Generally, yes—to varying degrees. However, there is room for improvement. To use a practical analogy—if one tries to store a square box inside a cylindrical box, one isn't able to use as much of the space as one could if both boxes were the same shape. Using economic and engineering models, a program can reach some customers. But using a model that "fits" customer behavior can open new opportunities.

A quote from Lutzenhiser et al. (2009) illustrates the issue:

> *The effects of weather, buildings, and equipment are described and predicted by theory in meteorology, physics, and engineering. The effects of behavior should be informed by theory and research in sociology, psychology, economics, and anthropology—the social sciences.*

Potentially, behavioral science could help programs use their resources efficiently. If programs are aware of which strategies may be the most effective, they can prioritize accordingly. For example, OPOWER (formerly Positive Energy) has developed ways to reach large groups of residential customers through combining advanced billing with raising awareness of social norms (Ayres, Raseman & Shih 2009). Programs can also accomplish this by creating and using toolkits like the commercial kit developed by Kilojolts (Kilojolts 2010) and the municipal one developed by Clean Air, Cool Planet (CACP 2010). These toolkits can help organizations understand their energy use and motivate them to take action.

Providing information only—without considering what might motivate customers to take action, become interested in saving energy, and tell others about the project—can reduce the breadth and depth of program outcomes (McKenzie-Mohr 2009). Industrial programs, which can achieve very high levels of savings within one organization, emphasize actions and results (Dow 2010).

Behavioral programs that use social science concepts often draw on elements of Cialdini's "Six Weapons of Influence" (Roberts 2010):

- *Reciprocity* (repaying favors)
- *Commitment and Consistency* (making public commitments)
- *Social Proof* (following others' example)
- *Authority* (doing what authorities recommend)
- *Liking* (responding to messages from sources one likes)
- *Scarcity* (seeking out what is perceived as scarce)

Some of these concepts—for example, social proof—are more widely used than others. Programs would benefit from setting up experiments to test potentially productive ideas (such as looking at the effects of scarcity and reciprocity). For example, a pilot program could study ways to generate enthusiasm about weatherization, which is unattractive to some customers because of its perceived abundance and low cost, which relates to both scarcity and social status (Lutzenhiser et al. 2009). (In contrast, solar panels are less common, more expensive, and relatively appealing to the public.)

People are aware of the communities around them when they take action to save energy. These communities consist of households that are often different from one another. Considering energy users as communities rather than individuals—and recognizing that there is no "average

homeowner"—could lead to further ideas for experimentation (Lutzenhiser et al. 2009). The CIEE series gives many recommendations for research and explains how to use scientific experimental design for improved validity (Sullivan 2009; Lutzenhiser et al. 2009; Ehrhardt-Martinez, Laitner & Keating 2009; Skumatz, Khawaja & Colby 2009).

In the energy efficiency field, programs apply social science concepts using the techniques below (as well as others):

- *Social Proof, Authority* and/or *Liking*
  - social norms (telling people what their peers and/or community are doing)
  - social networks (communicating through existing community connections, including workplace culture and expectations)
  - social marketing (making an action "easy, fun and popular")
- *Commitment and Consistency*
  - competitions and commitments (giving people recognition and community support for taking action, including certifications, credentials, and product labeling);

Community-Based Social Marketing (removing or minimizing obstacles to an action while expanding and emphasizing its benefits) may combine a variety of these ideas. Although there is some overlap between social marketing and Community-Based Social Marketing (CBSM), the two techniques are distinct and spring from different disciplines. While social marketing is common in the business and advertising world, Community-Based Social Marketing is a behavior change approach from environmental psychology. CBSM is interdisciplinary and uses a structured method of prioritizing, pilot-testing, and evaluating measures. While social marketing is common in business, CBSM is relatively new (McKenzie-Mohr 2009; Skumatz, Khawaja & Colby 2009; Smith 2009).

Some of these techniques—such as the social norms approaches that OPOWER and other companies use—are becoming relatively familiar. The state of Massachusetts recently approved energy efficiency funding that covers a social norms-based program (MDPU 2010). But other methods (including Community-Based Social Marketing, which has a solid track record in public health education and other areas), are relatively new to energy professionals (McKenzie-Mohr 2010).

One Change, a multi-issue environmental behavior change initiative, has used an approach similar to CBSM for years. Its approach relies on reciprocity, targeted outreach, and credibility (for example, working with community leaders) (OC 2010). It is likely that we will see more published data from this and similar programs in the future.

Although the fact that a technique is becoming well-known can show that programs have worked out how to achieve results cost-effectively, reaching beyond proven methods is important. That is likely to remain true in the future.

Program Models

Buildings and Utilities

Behavioral programs for utility customers and building construction (or maintenance) use a set of strategies that can be loosely grouped by their approach to saving energy.

Feedback programs make energy use more visible to customers. Feedback programs use and sometimes combine improved billing, metering, and Web-based tracking (Ayres, Raseman & Shih 2009; PAC 2010; Ehrhardt-Martinez, Laitner & Keating 2010; Faruqui & Sergici 2010; Hydro 2009; Khan 2009). They sometimes use financial incentives. They may also use social science and marketing to make their messages more relevant and useful to customers. (For example, if a program identifies that a customer has a swimming pool, the customer may see recommendations about pool pump efficiency.)

Compared to the other types of behavioral programs below, feedback programs are relatively straightforward to evaluate. Evaluators combine surveys, meter data, and/or Web site access data to assess the outcome of each program. However, some concerns remain. Utilities can track changes in energy use and analyze the results, but identifying causes and their effects can be challenging. Planning evaluation methods in advance can facilitate the process (Faruqui & Sergici 2010). Surveys can measure customer satisfaction and other important information, but do not necessarily reflect actual energy use (PAC 2010).

The programs in this review installed one meter or in-home display per house, at most. Some relied on customized mailings in addition to regular billing; this approach is relatively low-cost and can cover large groups of customers (SB 2009).[4]

Web-based feedback tools are gaining momentum and becoming more user-friendly. Multiple companies are using this strategy. In New England, Web-based feedback is gaining a greater foothold; other regions are also active (PAC 2010). As companies gain experience, they improve their user interfaces and decide which social science methods to use.

An innovative program in Wisconsin combines online social networking with comprehensive carbon footprint tracking. The program uses social norms, utility bill data, action tips, success stories, and online discussion groups. Participants also see information on the potential impact of global warming in their state (SAGE 2010).

Media campaigns take an entirely different approach—one which can cover large areas, but can be difficult to evaluate. These campaigns use radio, TV, outdoor advertising, Web sites, and/or print publications to reach the public. Media campaigns offer the opportunity for programs to develop eye-catching messages that promote specific energy-saving actions. They can use market segmentation to reach specific groups and can research customer responsiveness to the campaigns.

Storytelling plays an important role in media campaigns. Constructing persuasive messages about energy efficiency can go far beyond promoting financial incentives. Media researchers have analyzed how storytelling influences public discussion of climate change (McComas & Shanahan 1999). This insight also applies to energy efficiency programs conducting media outreach.

Media campaigns can also use educational entertainment as a behavior change strategy. Karen Ehrhardt-Martinez and Carrie Armel have cited the techniques that the Population Media Center uses for its health outreach in Africa (Ehrhardt-Martinez 2008). These techniques are based on a synthesis of five theories related to communication and behavior change. The Population Media Center has worked cross-culturally in many countries worldwide (PMC 2010).

Many states do not quantify savings from media campaigns. While it can be difficult to assess how much energy customers saved due to a given campaign, programs are taking steps in that direction. Vermont's New Bulb in Town TV campaign—starring a CFL with a cowboy hat—held focus groups to identify the effects of the ads. They used control groups to account for the effects of another recent CFL campaign. Customers in the focus group reported they were more interested in purchasing CFLs after viewing the ads and frequently planned to do so (KEMA 2010a).

Since the intention to purchase a CFL is not equivalent to the act of doing so, asking a random sample of customers how many CFLs they had purchased and installed—and when they had done so—would be the next step toward closing the loop and demonstrating energy savings and persistence for media campaigns. In-home verification would provide additional advantages. Providing evidence of savings could facilitate funding and expanding these programs.

[4] As behavioral programs expand their reach, they have begun including natural gas as well as electric utilities. OPOWER, for example, designed a natural gas program for Puget Sound Energy (BusinessWire 2009).

Community-based programs rely on many forms of interpersonal interaction. Efficiency programs may work together with community-based organizations (CBOs) to reach low-income communities and groups that may not speak English or may have limited access to mainstream media (Hipps & Hungerford 2004). Efficiency programs also partner with towns and cities to engage local communities (CACP 2010). Participants may commit to take energy-saving actions, compete for awards or recognition, or talk with their neighbors about saving energy (ES 2010; CSF 2010; OC 2010; TNS 2010).

These types of programs clearly have potential. However, there is little evidence of the energy savings they are achieving now. The Energy Center of Wisconsin recommends that community-based programs build credibility and expand their reach by asking stakeholders for input, collecting success stories, surveying participants, and evaluating energy savings. Evaluation data can inform program design and structure. Collecting data on jobs creation and support of local business can be particularly useful (Cowan 2010). There can also be technical difficulties in scaling up small, intensive programs to larger regions.

Trades certification programs provide recognition and professional advancement for trade professionals who learn to maintain and operate energy-efficient technology. Researchers expect that demand for these certifications will increase. Some building operators are reporting greater job satisfaction as their work becomes more skilled and provides environmental benefits (Anderson 2010).

Education-only programs inform participants of ways to save energy. Utilities frequently provide tips for customers online or in print. These tips become much more effective when they are integrated with a marketing strategy that emphasizes customer benefits and reduces obstacles. Otherwise, even if they attend in-person workshops, customers still may not take the actions utilities promote (McKenzie-Mohr 2010).

Education programs that work together with low-income weatherization have yielded some promising results (Kushler & Vine 2003; Skumatz, Khawaja & Colby 2009). While other customers might consider weatherization time-consuming or unnecessary, low-income customers have a greater incentive to reduce their bills. Some residential customers see weatherization as a low-status activity (Lutzenhiser et al. 2009).

Other Web-based programs are on the horizon. These include, but are not limited to, energy efficiency gaming. Although online gaming may seem remote from energy efficiency, existing programs already use game theory in their work (Bukhin 2010b).

Industry

Many readers may be surprised that manufacturing firms have a long and highly successful legacy of running behavior programs targeted at improving energy efficiency in industry. In large part, this results from the aversion that many in the industrial sector have to the term ”behavior programs.” Rather, these activities in manufacturing tended to be covered under the rubric of “management.” These programs are in many cases more mature and established than programs run in other sectors of the marketplace.

In general, the behavior activities within manufacturing firms fall into three categories:

1. Corporate management initiatives
2. Employee engagement and motivation initiatives
3. Social norming among executives and companies

These industrial behavior programs are intended to support a range of corporate goals and, in many cases, are positioned to achieve multiple goals. Among the common goals are: worker safety; product quality; customer response time; productivity and uptime; waste minimization; environmental

compliance; demand response and energy efficiency; and reliability. What may not be immediately evident to the outside observer is that all these goals can be very interrelated, with most saving costs and improving profits for the firm. In that context, energy efficiency might be better be characterized as energy productivity, since the goal is to improve the profitability of the firm.

In most other sectors the focus of behavior initiatives is on the individual, while in the industrial sector the behavior of the firm itself may be a more important focus. Corporate management initiatives are focused on affecting the behavior of the organization. Employee behavior is clearly important. However, it is employees' behavior within the context of the firm, rather than as individuals, that is important to achieving corporate goals. Employee engagement and motivation initiatives are intended to, as the name implies, build awareness that results in behaviors in the workplace that achieve corporate goals.

For much of the past half-century, the focus of these efforts was on labor productivity, with great effect. We have seen dramatic reductions in labor intensity in manufacturing—on the scale of 80 percent— in the past three decades. As a result, the opportunities for achieving cost savings from labor productivity improvements have diminished. In response, the corporate focus has shifted to "resource" productivity, with energy being one of the major resources—particularly in materials manufacturing industries such as metals, ceramic products, chemical products, wood products, and food products. While energy has been an important resource cost for many of these energy-intensive industries, we are now seeing this becoming a focus for a broader range of firms.

Below, we expand on the scope and history of these two categories of industrial behavior initiatives. In the following chapter, we provide case studies to illustrate them.

Corporate management puts in place the management systems that ensure the success of the firm in the marketplace. Extensive literature exists about decision making within a management context. These management systems are intended to provide a structure within which corporate decisions are made, producing consistency and optimizing outcomes for all aspects of business operations.

Almost all firms have management systems incorporating operational activities such as accounting; purchasing; sales; operations; product quality; and environment, health and safety (EH&S). In large firms, these systems can be very complex.

Firms such as SAP, Oracle, and IBM provide the information management platforms for companies to build these systems. Some of the most successful corporate energy efficiency efforts have resulted from incorporating energy management into these systems (Prindle 2010).

Incorporating energy into management systems does not present any unique challenges beyond those that companies face in managing any other aspect of business operations. Rather, the challenge lies in identifying the key information collection and reporting needs while putting in place the structures necessary to collect this information. In some cases, companies have incorporated energy into management systems as an extension of product quality assurance (e.g., ISO-9000) or environmental health and safety (e.g., ISO-14000) elements within their information systems. In other cases, they have developed energy management as a discrete element of their operations (Imel & Gromacki 2007; Prindle 2010).

In response to this need, the energy management community has been working over the past decade to develop a corporate energy management standard, ISO-50001 (SEP 2009). Cook Composites and Polymers served as one of the pilots for ISO-50001 development (Ferland et al. 2009; Imel & Gromacki 2007).

Companies face two significant hurdles in incorporating energy into corporate management systems. The first potential hurdle is that corporate leaders may or may not be aware of the benefits of actively managing energy use and the need for doing so. The second is that companies need to achieve a sufficient level of commitment to implement the programs.

Building corporate commitment has been the focus of many programs and tools over the past two decades. Many programs at the federal, state, and utility level, such as ENERGY STAR for Industry, have sought to encourage corporate commitment to energy management by providing tools, technical assistance, and recognition (EStar 2010). These programs incorporate the concepts of continuous improvement.

One interesting resource that many of these programs have incorporated is the One2Five product suite that Energetics of Australia developed in the 1990s (Energetics 2010). This product is now owned and marketed by EnVINTA (EnVINTA 2010). This suite of tools takes a structured approach to building a corporate energy management system based upon the principles of continuous improvement. A wide range of utility and public-sector industrial energy efficiency programs across the country have used this tool. The regions that have used this resource include Illinois, the Northwest, and Wisconsin (Amundson et al. 2009; Andersen, Eaton & Dantoin 2007; Hammon & Lloyd 2007; Peters 2004). This tool suite has been well received in the corporate world because it is built upon existing management practices. This consistency can create the management support necessary to incorporate energy into overall corporate management systems.

In addition to the focus on energy management within the firm, we are seeing an emerging trend of focusing on energy productivity in the supply or value chain and extending these management systems to supplier networks. This trend began to emerge over two decades ago when domestic and foreign-owned automobile manufacturers realized that most of the energy used in building their products was consumed by their suppliers and not by their own facilities, which had become largely assembly facilities (Elliott, Pye & Nadel 1996; Prindle 2010). By changing supplier behavior on energy efficiency, firms have an opportunity to reduce suppler costs while improving corporate product quality, productivity and profitability. More recently, we have seen this trend extend to consumer products companies, ranging from food producers such as PepsiCo and Coke to retailers such as Wal-Mart (Prindle 2010). While these integrator firms have significant leverage over their suppliers, the understanding of these inter-firm behavior dynamics is less developed than that of corporate energy management.

Employee engagement and motivation programs provide incentives for energy-efficient actions. Empowering workers has been an integral element of the continuous improvement management philosophy since its inception. For decades, many corporate managers have viewed this as an effective strategy for achieving energy efficiency in manufacturing facilities. For example, 3M implemented a sub-metering and reporting program at its manufacturing facilities beginning in the 1980s and noted a measurable drop in energy consumption (EERE 2010).

Another example is the Louisiana Division of The Dow Chemical Company that, beginning in 1981, ran a program to change corporate culture with respect to energy use (Nelson 1993). The program was an annual energy contest that encouraged employees to identify energy-saving capital projects. The projects were required to cost less than $200,000 and have a return on investment (ROI) of greater than 100 percent. The program operated continuously through 1993 with impressive results (Nelson 1993). It was successful because it worked within the corporate culture and empowered employees to look for savings.

This employee-focused effort continues to be successful, as a more recent example at the Nucor Steel Jewett Texas facility shows. This effort built upon a previous safety program at the facility that shifted a paradigm at the plant by making each team, division, and individual employee responsible for working safely every hour and every day. The goal of the safety program was to make everyone's safety a personal responsibility for every employee. The facility's "Energy Intensity Strategy" was to develop a culture of energy consciousness by having every "team at the floor level understand and develop the desire to drive energy consumption down while continuing to drive production up to higher levels." The plant energy team undertook "best marking" with sister plants and with the industry through U.S. Department of Energy audit tools, measuring and reporting results to the team. The plant reduced energy consumption by 10 percent while increasing production (Shaw & Rappolee 2008).

The concept of raising worker consciousness is a recurring element of corporate energy efficiency efforts. One strategy seen in the Nucor example, as well as many other programs, has been to build energy consciousness at home as a way to sensitize employees in the workplace. 3M and Alcoa (Archell 2010) have both implemented this strategy to good effect in their corporate energy management.

Social norming among executives and companies is an important type of initiative that has a successful track record of influencing energy-efficient behavior. In contrast with the two prior types of efforts, this effort is focused outwardly and supports the reputation of the company among its peers and the public. Some of the numerous examples of this effort include public recognition programs such as EPA's ENERGY STAR awards and DOE's Save Energy Now® LEADER initiatives (EStar 2010a; EERE 2010a).

Also, a number of organizations have established peer networks that encourage sharing best practices. These networks are intended to inspire competition among companies and executives. The networks include the World Business Council for Sustainable Development, the Pew Center on Global Climate Change's Business Environmental Leadership Council and the Business Council for Sustainable Energy (BCSE 2010; Pew 2010; WBCSD 2010). Within individual companies, the proliferation of corporate social responsibility and sustainability goals demonstrates this behavior in the business community.

Transportation

The transportation sector is a breeding ground for behavioral policies and programs that aim to reduce fuel consumption and greenhouse gas emissions. Programs in this sector are incentive-based. Cost savings, which may be directly or indirectly efficiency-related, are the primary incentives for these programs.

Behavioral programs in the transportation sector are largely designed to promote using vehicles efficiently (in terms of both driving behavior and modes of vehicle use), traveling reduced distances (vehicle miles traveled, or VMT), and/or purchasing efficient vehicles.

Reductions in vehicle miles traveled can be achieved through using compact community development patterns, improving transit service, and encouraging non-motorized modes of travel. While economic considerations are important determinants of the viability of these strategies, behavioral factors are crucial to their success. The choices of where to live and how to travel are basic lifestyle decisions. The appeal of a lifestyle that involves less driving is only now gaining currency in the United States. Programs promoting walking and biking, like Safe Routes to School, emphasize the health benefits of these activities. Decreasing air pollution is an important non-energy benefit of programs that reduce vehicle miles traveled.

Corporate transit, ridesharing, and telecommuting programs reduce vehicle miles traveled during commuting. Companies typically sponsor these programs for their employees and offer a variety of incentives for participation. The accessibility of workplaces and corporations' attitudes toward urban vs. suburban facility location often determine whether or not their employees will have practical alternatives to driving.

Efficient driving can be encouraged, for example, through driver training and signs that discourage aggressive driving. Companies may offer special recognition to commercial truck drivers who minimize fuel use.

Some auto manufacturers have taken the initiative to educate consumers about efficient driving practices. Industry-introduced technologies such as Ford's SmartGauge™ with EcoGuide technology make vehicle efficiency more visible to drivers via instant fuel economy readouts on dashboards. These technologies educate drivers about their habits. Ford's latest MyFord Touch™ in-vehicle system, which will appear in the 2011 Ford Edge and MKX, goes further, calculating an "EcoRoute"

option for drivers, along with the "fastest" and "shortest" route options.[5] The system chooses the "Eco-Route" to avoid congestion and maintain an efficient and consistent driving speed (Ford 2010a).

High-efficiency vehicle purchase and retrofit programs, such as the two programs profiled in this review, tend to be larger-scale initiatives implemented by federal and state governments. SmartWay, sponsored by the U.S. Environmental Protection Agency, provides recognition and certification to trucking companies that improve environmental performance by retrofitting their fleets with efficient technologies; using best practices; or updating older equipment with newer, more fuel-efficient vehicles and components. The program uses labeling and competition to raise awareness of energy efficiency and motivate behavior change.

France's feebate program for passenger vehicle purchases encourages customers to change their purchasing decisions by offering a rebate for highly efficient vehicles and charging a fee for less efficient vehicles. Similarly, statewide hybrid and electric vehicle tax credits encourage the purchase of efficient vehicles by offsetting high upfront costs.

Feebate programs can complement fuel economy standards, though they may be similarly controversial. Since feebate programs prod the auto industry to shift its manufacturing investments, they encounter resistance in some settings.

CASE STUDIES

Buildings and Utilities

Case Study 1: Building Operator Certification Program, Kansas City Power & Light

Background

The Building Operator Certification (BOC) program is an education and training program targeted at commercial and industrial building operating staff and facilities management personnel. The training focuses on operations and maintenance (O&M) strategies to improve energy efficiency, occupant comfort, and overall facility performance.

Program participants are eligible for certification as a BOC professional upon completion of the training course, field assignments in their workplace, and passage of the certification exam. The BOC curriculum changes O&M behaviors by increasing building operators' understanding of building systems, awareness of energy-saving O&M opportunities, and technical skills for effectively addressing these issues.

The program also seeks to (1) enhance recognition of the role building operating staff play in saving energy and improving building performance and (2) increase the value of building operators to building owners and managers through professional certification. There is some evidence that this type of training increases building operators' job satisfaction (Anderson 2010).

First developed and offered in the Pacific Northwest in the 1990s, the BOC program is now offered in 25 states throughout the country. Kansas City Power & Light (KCP&L) offers one of the newer BOC programs in cooperation with the Midwest Energy Efficiency Alliance (MEEA) and the Missouri Department of Natural Resources Energy Center. KCP&L first offered BOC training in July 2007.

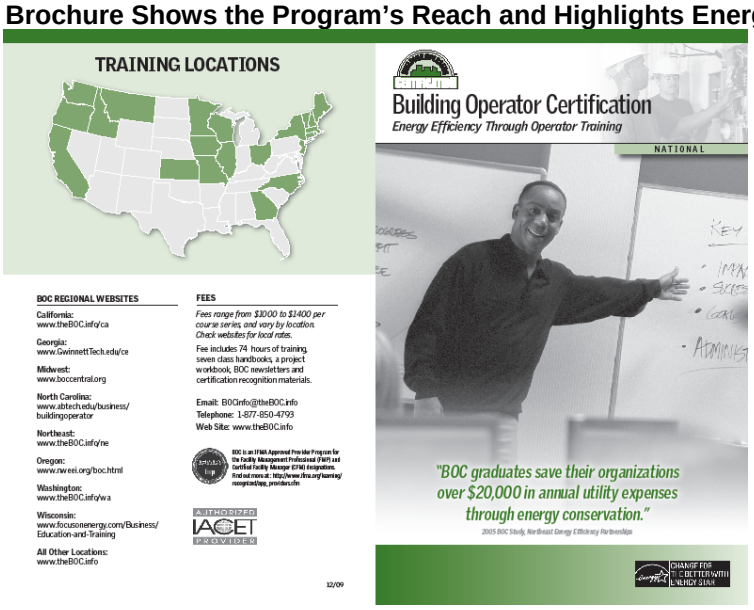
Over the first two years of the program, KCP&L ran four Level I BOC training classes for a total of 79 graduates from 38 distinct companies and organizations. The six-month course costs $1,150; KCP&L offers participants a $575 rebate to offset tuition upon successful completion of the course and holds a graduation ceremony to recognize them for their accomplishment.

[5] http://www.fordvehicles.com/cars/fusion/trim/?trim=hybrid

Ninety-three percent of participants rated the KCP&L BOC program "very good" or "excellent." Seventy-five percent of them believe they have saved energy, reduced demand, or saved money in the facilities they operate (ODC 2009). Participant satisfaction levels are in line with the levels reported for BOC programs in other parts of the country (McRae & Mayo 2006). In May of 2009, KCP&L expanded its BOC program by offering the first Level II training.

Graduate satisfaction with the BOC program translated to changes in behavior on the job. As a result of actions undertaken based on their BOC training, graduates saved an estimated 9.2 million kWh of electricity and 35,000 therms of gas while reducing demand by 2,300 kW (ODC 2009). This translates to an average of 43,600 kWh per graduate and 0.02 kWh per graduate per square foot of building floor space, far exceeding initial program goals of 12,500 kWh per participant (ODC 2009).[6] In addition to undertaking changes in O&M practices (e.g., improved heating and cooling system, motor, and air compressor maintenance; improved lighting controls programming and maintenance; and better management of Heating, Ventilating, and Air Conditioning and Energy Management Systems controls), participants reported improved skills and confidence in their ability to assess purchasing options and payback for energy efficiency, justify new O&M practices and capital investments to management, and work with contractors to ensure the most effective outcomes (ODC 2009).

Figure 1. A BOC Brochure Shows the Program's Reach and Highlights Energy Cost Savings



[6] In comparison, an evaluation of the Northeast Energy Efficiency Partnerships BOC program found savings of 31,500 kWh per participant (RLW Analytics 2005).

Accomplishments

Start Date	2007
End Date	In progress
Reporting Period for Benefits and Costs	July 2007 through March 2009
Number of Participants during Reporting Period	79 students from 38 companies/organizations
Number of Customers Offered the Option to Participate	KCP&L markets the BOC program directly to building management and operations staff through account managers and also uses bill inserts and newsletters to promote the program. MEEA markets the program throughout the region by participating in regional trade shows, conferences, and events and using its targeted BOC Central Web site (http://www.boccentral.org).
Energy Saved	9.2 million kWh and 35,000 therms
Costs Paid by Program	N/A
Costs Paid by Customers and Others	$1,150 (fee for BOC course); $575 rebated upon graduation
Cost-Effectiveness	N/A
Cost-Effectiveness Test	N/A
Non-Energy Benefits	Enhanced building occupant comfort, improved indoor air quality, increased water savings, improved job performance, increased job responsibilities, and increased compensation
Sources of Data	KCP&L; ODC (2009); Pagnusat (2010)

Behavioral Measures and Customer Responses

The BOC program relies on education and training activities and professional recognition to change the behavior of building operations and facilities management personnel, particularly with regard to O&M practices. While the targeted practices may include technology selection and equipment upgrades, the majority involves no-cost or low-cost changes in the way operating staff program, use, and maintain building systems.

A secondary effect is that the program changes the behavior of building management by boosting their confidence in their better-educated and newly-credentialed operations staff and increasing the value they place on the operating professionals' role and their ability to provide energy savings, improved comfort, and enhanced building performance.

Social norms play an unstated but important role in BOC programs. Students support each other in taking action and report the results to the group. Employers' interest in hiring certified building operators can also change the norms in the field.

High levels of satisfaction with the program—reported by both participants and building managers—have enabled KCP&L to continue to meet enrollment targets without extensive marketing. Word-of-mouth recommendations generate enough new students to exceed program goals. In interviews, BOC program participants from around the country consistently give the program high marks (McRae and Mayo 2006).

Comments from students:

"The BOC helped my job performance simply by giving me confidence."

"It increased my knowledge and awareness of energy savings techniques."

"It broadens your range in any type of work. We are involved in all types of systems, so it gives a good overview. I even saved money on my own bill at home."

Comments from management and supervisors:

"In meetings, he is more informed about preventing problems."

"He takes more responsibility…And he is taking the lead on a rigorous energy conservation project for all 22 city buildings."

"We made a dangerous man out of him by putting him through the training. Now all he wants to do is save money."

Outlook

KCP&L continues to offer the BOC program and has expanded its scope to include both Level I and Level II courses. Since the above evaluation was completed in March 2009, this program has offered four Level I course sessions and two Level II course sessions. Eighty-three additional participants have graduated from the program. The program team is discussing further opportunities to expand the program and market to a wider range of building operating staff and owners throughout the region (Pagnusat 2010).

Case Study 2: Residential Smart Energy Monitoring Pilot, GroundedPower and Cape Light Compact, Massachusetts

Background

Massachusetts has engaged in energy efficiency work for many years and is currently expanding its investment in this area. The state has also made a commitment to use behavior change strategies to increase the reach of its programs (Vine 2010).

This pilot program used data from in-home energy monitoring systems to encourage residential customers to reduce their energy use. Customers viewed the feedback and tips online.

Three organizations partnered to deliver the program: Cape Light Compact, an electric utility; GroundedPower, the program developer; and Rise Engineering, the installation contractor. PA Consulting evaluated the program (PAC 2010).

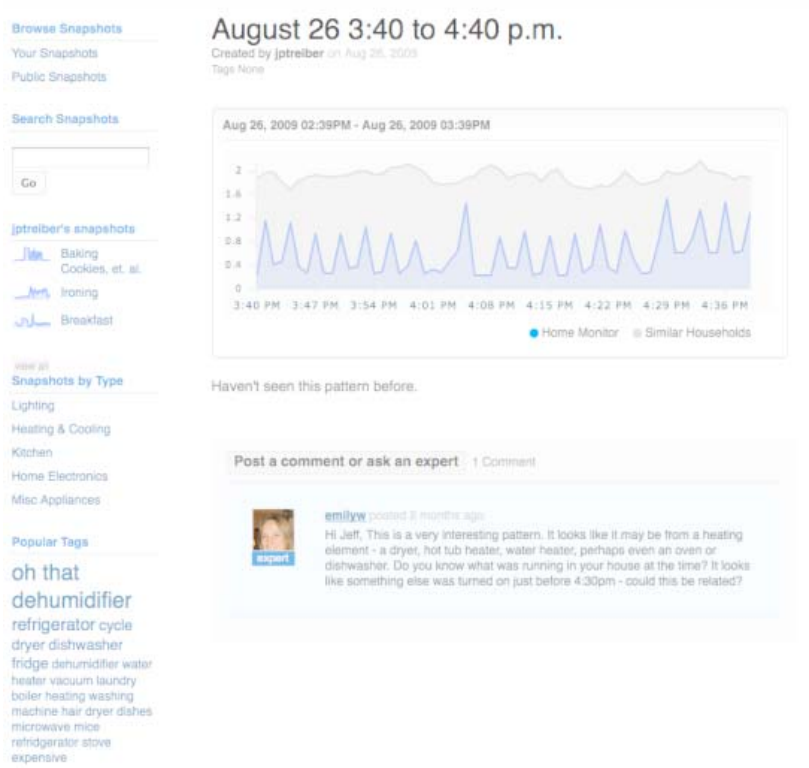
The home energy monitors measured energy use at the power meter locations for each house. GroundedPower recorded this information in real time, using wireless Web connections, and reported the data to customers via the program Web site. The site included both energy graphs and behavioral features. The graphs reported savings in kWh and dollars and/or reductions in global warming (measured as carbon dioxide emissions). Cape Light Compact also used the Web site to cross-promote other energy efficiency programs and incentives, including http://www.myenergystar.com/ (PAC 2010).

PA Consulting recommended making some changes to the program before scaling it up for a larger group of customers. These changes included creating incentives to encourage customers to visit the Web site more often; conducting focus groups to identify ways to sustain persistence; and allowing time for delays due to installation, maintenance, and scheduling issues (PAC 2010).

This program could become a model for other metering programs, especially in areas where market research shows customers are curious about their energy use. GroundedPower made innovative use of behavioral concepts by encouraging customers to set goals, compare their performance to other households, and educate each other. Because the program requires wireless access and is designed

for homeowners, it may not meet the needs of customers who do not use the Internet, cannot afford wireless access, and/or live in multi-family housing.

Figure 2. GroundedPower's User Interface



Source: CNet (2009)

Accomplishments

Start Date	Spring 2009; installations completed in 7/2009
End Date	1/2010
Reporting Period for Benefits and Costs	N/A (No benefit/cost data are available.)
Number of Participants during Reporting Period	100 households; 91 completed the program; 72 percent of these completed the survey
Number of Customers Offered the Option to Participate	A newspaper announcement led to 340 customer responses; 100 households participated in the program, while the others became the “interested” control group. Cape Light Compact also collected data from a second control group of households that were selected at random.
Energy Saved	9.3 percent, on average, after adjusting data for weather and customer participation in other utility programs
Costs Paid by Program	N/A
Costs Paid by Customers and Others	The program was free; however, many customers reported that they would be willing to pay to continue using the Web site and meter. The amount they were willing to spend varied over a wide range.
Cost-Effectiveness	N/A
Cost-Effectiveness Test	N/A
Non-Energy Benefits	Awareness; customer engagement
Sources of Data	PA Consulting

On average, participants reduced their energy use by 9.3 percent (compared to a blended control group). To account for the effects of environmental motivation and other factors, the program developers used an experimental design with two control groups. One control group consisted of "interested" households that had applied to the program but were not selected to participate. The other control group consisted of randomly selected similar households that had not applied to the program. GroundedPower adjusted the results for weather by comparing customers' energy savings to their energy use during the previous year (PAC 2010).

A third party, PA Consulting, evaluated the program, combining energy savings data with Web traffic statistics and customer surveys. The surveys covered demographics, attitudes, and behaviors (PAC 2010).

As is common in many parts of Massachusetts, the participants in this study had relatively high incomes and had often completed college and graduate degrees. There were minor demographic differences between the test groups; although income differences weren't significant, customers who applied to the program tended to have more education and fewer children living at home than the control group participants did (PAC 2010).

The most reliable predictor of savings was the frequency of customer visits to the program Web site. The survey data—demographics, attitudes, and even reported behaviors—did not predict the energy savings that occurred. Because of this, PA Consulting recommended that programs gather energy savings data rather than relying on self-reported results alone (PAC 2010).

Customers who saved more energy did not report making more behavioral changes than other customers did. However, they did comment that their general awareness of energy use had increased. The customers who saved the most energy were the ones who paid the most attention to the Web data. This could indicate that viewing the online graph helped customers discover which actions were working and which were not effective (PAC 2010).

The evaluators commented that viewing the program Web site may have biased customers' survey results. Seeing online reminders about saving energy may have led customers to think they were accomplishing less and needed to take more action. Therefore, compared to the control groups, customers who were using the Web site may have underestimated their behavior changes (PAC 2010).

During most of the pilot program, customer interest persisted, as measured by the frequency of customers' visits to the site. However, during the winter holiday months toward the end of the pilot, customer interest began to fluctuate, with very high activity weeks alternating with lower activity weeks. There was a moderate drop in interest during February 2010, the last month of the program. Evaluators recommended using focus group research to improve persistence when setting up larger-scale versions of this program (PAC 2010).

Behavioral Measures and Customer Responses

Customers were very responsive to the program. Although there were only 100 openings for participants, 304 households responded when Cape Light Compact marketed the program. This only required one newspaper announcement. However, Cape Light Compact's customers had already expressed more interest in saving energy than might be typical in other areas (PAC 2010).

The site included goal setting, advice, and social norms (comparing customers to groups of similar households). Customers could also share tips with each other to encourage greater energy savings (PAC 2010).

At the end of the pilot program, 90 percent of the participants said they were "very interested" in continuing to use the Web site. Access to the site was free during the pilot program. The customers who were interested in keeping the system at the end of the pilot were willing to pay $7.57 per month,

on average, for access to the site. However, their willingness to pay for site access varied widely, with some customers being unwilling to pay any cost at all while others were comfortable paying up to $30 per month. Evaluators recommended including a small fee as part of the program to increase customer engagement.

The participants were much more interested in the graphs of their home energy use than in their carbon dioxide emissions (PAC 2010). As results become available from other programs that make more direct connections between energy use, carbon dioxide, and global warming, that may provide a useful basis of comparison (SAGE 2010).

Customers were not entirely satisfied with the level of detail and breadth of information they could access online. Some expressed interest in having a more interactive site and exporting their data to Excel. The evaluators recommended that larger-scale programs pay close attention to online interface design (PAC 2010).

Customers also requested appliance-specific data:

“I wish there was a way of clearly identifying what the spikes mean. It would be wonderful if it would say this is your electric heater, [or] it would identify the appliance using the energy…”

However, even without that information, some customers figured out which of their appliances were causing spikes on the graphs:

“…When we saw the big spikes, I was able to figure out what it was from, which allowed us to change… When we get up in the morning [and] we turned the 60 inch plasma screen on; we didn't realize what a big energy user that was. So we bought a small 22-inch energy-efficient TV for the kitchen…. that brought our bill down 25 to 30 dollars a month.”

“I've gone from doing three loads of laundry a day down to one load a day. Once you realize the impact of some of one's actions and how it affects energy use, one adjusts his/her usage, and that is what we've done.”

The program was more useful for some customers than others:

“I was already quite conscious of energy use, so I didn't have a lot of room left for improvement.”

PA Consulting recommended allowing additional time to screen potential participants and to schedule meter installations and repairs. The stakeholders had planned their communication using a flow chart. The process went well, but there was a three-month delay while Cape Light Compact and the contractor, Rise Engineering, were installing the meters and troubleshooting technical issues. These scheduling and technical issues reduced the sample size from 100 to 91 households (PAC 2010).

In the future, providing incentives to increase customer visits to the Web site might further increase energy savings and improve persistence.

Outlook

Cape Light Compact is now discussing plans to expand this program. As of April 2010, GroundedPower is now also working with over six other companies in Massachusetts on similar projects (Bukhin 2010a).

Case Study 3: Flex Your Power, Efficiency Partnership; Runyon, Saltzman & Einhorn; and Staples Marketing, California

Background

In 2001, the California energy crisis sparked the growth of innovative energy efficiency programs. One of these new programs was Flex Your Power, a statewide media and outreach program that was funded via emergency legislation in 2001 and continued in various forms through 2009 (CPUC 2009; Kushler and Vine 2003; Wellner 2010).

Some of Flex Your Power's main successes were its brand recognition, its ability to reach Spanish speakers, its collaboration with rural community-based organizations, its research-based message development, and its online presence (ODC 2008). The state later reused the "Flex Your Power" brand in the "Flex Your Power Now!" demand response media campaign (Hummer, Firestone & Zentai 2008).

Over the years, Flex Your Power's main goal shifted from promoting specific utility programs to raising awareness. Interestingly, part of the reason this goal changed was that too many customers were responding to the media outreach by enrolling in utility programs. Demand for programs may have increased due to strong encouragement from public officials, a history of rolling blackouts, a pre-existing shortage of programs, and daily news coverage of the energy crisis. The evaluation report shows that, apparently, the decision to promote general awareness rather than specific actions made it less straightforward both to save energy and to quantify the results of the outreach program (ODC 2008).

Since 2005, the California Public Utilities Commission (CPUC) has evaluated outreach programs based on their savings, but has also included other factors. The CPUC examines "(1) any direct energy savings impacts attributable to the activity; (2) the intention to act, if no direct impacts are possible to measure; and (3) the reach of the advertising/marketing activity, the frequency of the activity and the leveraging of ancillary resources that comes from the activity" (ODC 2008).

In 2006 and 2007, Flex Your Power's goals were to communicate "statewide messages on simple things individual consumers can do to reduce energy consumption and their bills," to increase "consumer awareness of and participation in the statewide programs available to them," and to "persuad[e] consumers to make permanent changes to their homes and businesses so that energy savings are not dependent on behavior once the energy efficiency measures are installed" (ODC 2008).

Flex Your Power was funded by the state and administered by a series of third-party contractors—Efficiency Partnership (the general program), Runyon, Saltzman & Einhorn (RS&E) (the rural program), and Staples Marketing (the Spanish TV program). The implementers operated these programs beginning in 2003; the programs were integrated, co-branded, and coordinated in 2006 (ODC 2008).

California has been a leading state on the energy efficiency front for many years. Although California regulators and the public may have been more receptive to this program because it appeared at a critical time when electricity was unreliable, the basic program model is transferable to other locations. In other regions, the market segmentation and messaging would differ. The evaluators recommended building a distinctive message with action recommendations to differentiate the campaign from other "green" advertising (ODC 2008).

Figure 3. An Image from the Flex Your Power Web Site

Source: FYP (2010)

Accomplishments

Start Date	2001
End Date	2010
Reporting Period for Benefits and Costs	1/2006 to 3/2008 (reporting periods differed for individual parts of the program)
Number of Participants during Reporting Period	Statewide campaign
Number of Customers Offered the Option to Participate	N/A
Energy Saved	N/A
Costs Paid by Program	$61.5 million (over 2 years)
Costs Paid by Customers and Others	N/A
Cost-Effectiveness	N/A
Cost-Effectiveness Test	N/A
Non-Energy Benefits	Increased awareness and public interest (especially among Spanish speakers)
Sources of Data	Analysis of messaging and ads; in-depth interviews and/or observation; customer surveys; reviews of planning documents and processes

According to the program model, state-level marketing and outreach were designed to raise public awareness of energy use. Meanwhile, individual utilities could capitalize on this awareness and promote specific programs and rebates. Evaluation showed these two levels of marketing were not coordinated adequately. This led to a lack of consistency in messaging and a lack of concrete action recommendations. During 2006-2008, the program achieved its goal of increasing interest in saving energy but did not provide a consistent call to action (ODC 2008).

Although 36 percent of survey respondents associated “Flex Your Power” with saving energy and many expressed interest in taking action, they were often unsure about the next steps to take. Program evaluators recommended solving this problem by directing customers to find energy advice via the program Web site and phone line. In 2006 and 2007, visitors accessed the site 1.1 and 1.8 million times, respectively. (Some of these may have been repeat visits.) The site directs visitors to utility programs and tax incentives. During media campaign seasons, Web site traffic increased by 33 percent, on average (ODC 2008).

In 2006-2007, program administrators used a range of outreach and publicity strategies. The program’s outreach strategy was multi-pronged and included television, radio, print, billboard, online, and in-person events. Collectively, Flex Your Power programs worked with media outlets in most zip codes in the state (ODC 2008).

The three programs coordinated their messaging. The programs emphasized global warming during 2007-2008 because market research showed that global warming was more important to utility customers than other possible motivations (including financial incentives). Many of the messages

promoted energy-efficient appliances and CFLs; the Spanish TV program also promoted weatherization (ODC 2008).

Flex Your Power could have benefited from using additional market segmentation to identify categories of customers who would be responsive to specific messages. There is significant overlap between the audiences for the three subprograms. The target audiences for the three programs differ but are all defined broadly, including homeowners and renters of various age groups between 18 and 64. The Spanish TV program was the only program that specified an income bracket (>$50,000/year) (ODC 2008).

The "general audience" program produced ads in English, Cantonese, Mandarin, Vietnamese, Korean, and Spanish; it also produced culturally-appropriate ads for Filipino, African-American, and Japanese audiences. The rural program used print, radio, and face-to-face outreach in both English and Spanish. The rural program also worked with community-based organizations as part of its outreach strategy. The Spanish TV program included some forms of grassroots outreach (ODC 2008).

Opinion Dynamics recommended that the programs combine their Spanish-language outreach within one program and consider additional market segmentation for Latino audiences to address the differences between new immigrants and the rest of the community (ODC 2008).

Evaluators found that Flex Your Power's rural program followed best practices when working with community-based organizations. Flex Your Power trained representatives of community-based organizations to conduct in-person events and work with the media (ODC 2008).

The program evaluation does not include either kWh savings or persistence measures (ODC 2008).

Behavioral Measures and Customer Responses

Flex Your Power's messages covered three basic categories: education, action, and concern for future generations. After doing market research, program developers replaced an emphasis on economic benefits with messages about global warming. Across the three programs, the most commonly shown actions involved using CFLs and replacing air conditioners (ODC 2008).

Customers found the messages "educational," "believable," "clear," "persuasive," and "empowering." They also found them "shocking," but not "depressing." Although they associated the Flex Your Power logo with turning off lights, they did not usually associate the Flex Your Power name with specific actions beyond saving energy in general (ODC 2008).

Spanish speakers responded more positively to the messages than English speakers did, commenting that they were educational. Eighty-four percent of the Spanish-speaking survey respondents were motivated to seek out more information and/or make behavioral changes. Surveys of California utility customers showed that, on average, Latinos were more concerned about global warming than non-Spanish speakers were (ODC 2008).

Outlook

In 2010, the state plans to replace Flex Your Power with a new program called Engage 360. Engage 360 will use multiple media channels to create conversation between energy efficiency experts and utility customers. This innovative program is scheduled to begin in 2010 (Wellner 2010).

Case Study 4: Home Energy Reporting Program, OPOWER/Positive Energy, and Sacramento Municipal Utility District, California

Background

OPOWER, formerly known as Positive Energy, has been a leader in augmenting utility billing systems by providing customized reports. So far, the organization has conducted 15 programs (Vine 2010). OPOWER partnered with the Sacramento Municipal Utility District (SMUD) to conduct its best-documented and longest-running pilot program to date. SMUD and other California utilities have engaged in innovative energy efficiency efforts for many years and are open to exploring behavior change approaches.

This pilot program shows that providing customized reports can be an effective means of reducing energy demand by ~2.4 percent over a 16-month period (SB 2009). OPOWER designed mailings to supplement SMUD's billing system. These mailings were based on a social norms approach and showed customers how their energy use compared to that of similar households in their community. The comparisons were both short term and long term. Customers also saw how their current energy use compared to their past energy use. Houses were assigned to "blocks" based on their location to increase the likelihood that neighbors would compare their bills. The bills included customized action recommendations based on demographics and household characteristics. The demographic data and household information were obtained online without using surveys (Ayres, Raseman & Shih 2009).

Improved billing methods, including using customized reports, are readily adaptable to large-scale programs and other geographical regions. In fact, OPOWER is already doing so (Vine 2010).

Accomplishments

Start Date	4/2008
End Date	8/2009
Reporting Period for Benefits and Costs	4/2008 to 8/2009
Number of Participants during Reporting Period	35,000 (minus 2 percent who opted out and 8 percent who relocated); 50,000 in control group (minus 7 percent who relocated)
Number of Customers Offered the Option to Participate	Same as above; both groups were selected randomly by the utility based on their location
Energy Saved	211 kWh/yr/household (monthly billing group); 130 kWh/yr/household (quarterly billing group) (data are from the first 12 months of the program)
Costs Paid by Program	N/A
Costs Paid by Customers and Others	N/A
Cost-Effectiveness	N/A*
Cost-Effectiveness Test	N/A
Non-Energy Benefits	N/A (no surveys took place)
Sources of Data	Online marketing databases; utility data; Sacramento County Assessor's office

* OPOWER's Web site cites overall cost-effectiveness figures, but no public reports are available.

Summit Blue Consulting evaluated the SMUD program and found a 2.2 percent average reduction in demand in the first year; this increased to 2.8 percent during the first four months of the second year. Evaluators used three different statistical models to estimate savings and found the results were relatively consistent (2.20 percent, 2.24 percent, and 2.13 percent) (SB 2009).

Savings fluctuated seasonally, being higher in July-September and December-April (2.6 percent and 2.2 percent, respectively) than at other times of the year (1.7 percent). These seasonal variations were driven by the activities of customers who used more energy and received more frequent mailings. Customers who used less energy and received quarterly mailings saved 1.4 to 1.6 percent year-round (SB 2009). A research paper attributes this higher rate of energy savings to SMUD's decision to send mailings more often to households that used more energy (Ayres, Raseman & Shih 2009).

This study provides some initial evidence of persistence into a second year of treatment. Further research will be needed to examine longer-term persistence.

Behavioral Measures and Customer Responses

Motivation based on social norms can yield energy savings. However, previous research demonstrates that a simple comparison to the average is not sufficient; if customers are simply shown that they are above or below average, the "high savers" lose their incentive to maintain their performance (Ayres, Raseman & Shih 2009). OPOWER uses emoticons (☺ or ☹) on bills to keep "high savers" motivated. However, the first year of data show that this effect still occurred; households that used much less energy than average benefited less from the program than other households did (Ayres, Raseman & Shih 2009).

OPOWER experimented with two envelope sizes and two ways of presenting the data (one using mostly graphics and one using both graphics and text). The first year of data showed that customers were most responsive to the bill that used mostly graphics and was packaged in a standard business envelope (Ayres, Raseman & Shih 2009).

OPOWER collected data online and from SMUD relating to household income, demographics, and home characteristics. The only factor that significantly correlated with a difference in energy savings was the presence of a pool (SB 2009).

There are some questions remaining about cause and effect attribution for OPOWER's programs. Although customers did save energy, the reasons for these savings are not entirely clear. A research paper on the first 12 months of the program reported that the rapid drop in energy use was more likely to be attributable to behavior changes (e.g., turning lights off) than physical measures (e.g., weatherization) (Ayres, Raseman & Shih 2009).

Combining the social norms approach of comparing customers to their neighbors with additional behavioral measures could potentially yield further savings.

Outlook

It's likely that OPOWER's model, along with similar programs, will continue to grow. The SMUD program has been extended through 2012 and will provide valuable persistence data (EPRI 2009). Since using customized reports is both economical and easily scalable, it appeals to utilities. Although states have shown interest in using customized reports to meet energy efficiency resource standards, some energy efficiency experts have proposed that this system become part of standard utility billing systems rather than being considered a discrete "program" that is counted toward those goals (Kushler 2010; Vine 2010). In that case, any savings from this work would add to, rather than displace, savings from other energy efficiency programs.

Based on the first year of data, Ayres, Raseman and Shih (2009) extrapolated the results to predict the outcome of larger-scale programs. If SMUD used OPOWER's customized reporting system for its entire customer base, and the effects were persistent in that large-scale context, SMUD could save over 110 million kWh/year. Since the reports were mailed separately from the regular utility bills, more

research is needed to show how customers would respond if the bills and reports were packaged together (Ayres, Raseman & Shih 2009).

Case Study 5: M-Power, Salt River Project, Arizona

Background

The M-Power program has earned national awards for simultaneously increasing energy efficiency and customer satisfaction. The American Public Power Association and the National Energy Resources Organization recognized these accomplishments (SRP 2009; SRP 2010b). Salt River Project (SRP), an investor-owned utility in Arizona, initiated an optional pay-as-you-go program in 1995 to prevent service disconnections for low-income customers. In 1999, SRP renamed the program and expanded it to cover the residential sector (Pruitt 2005).

In fiscal year 2009, nearly 78,000 customers participated in this program. Collectively, they saved 109,800 MWh that year. Households reduced their energy use by 12 percent, on average (SRP 2009; Warner 2010).

Pay-as-you-go programs reduce energy use by making the cost of everyday activities visible to customers. From a behavioral standpoint, customers tend to conserve money (and energy) when they are aware that they are using it (Ariely 2009).

Pay-as-you-go programs can be controversial, since consumer advocates are concerned about customers who cannot pay their bills and might lose their access to electricity. This program provided two advantages to low-income customers to partially offset this risk. First, customers no longer had to pay a $150 fee to reestablish access after service disconnections (Pruitt 2005). Second, customers' overall energy use dropped, lowering their electricity costs.

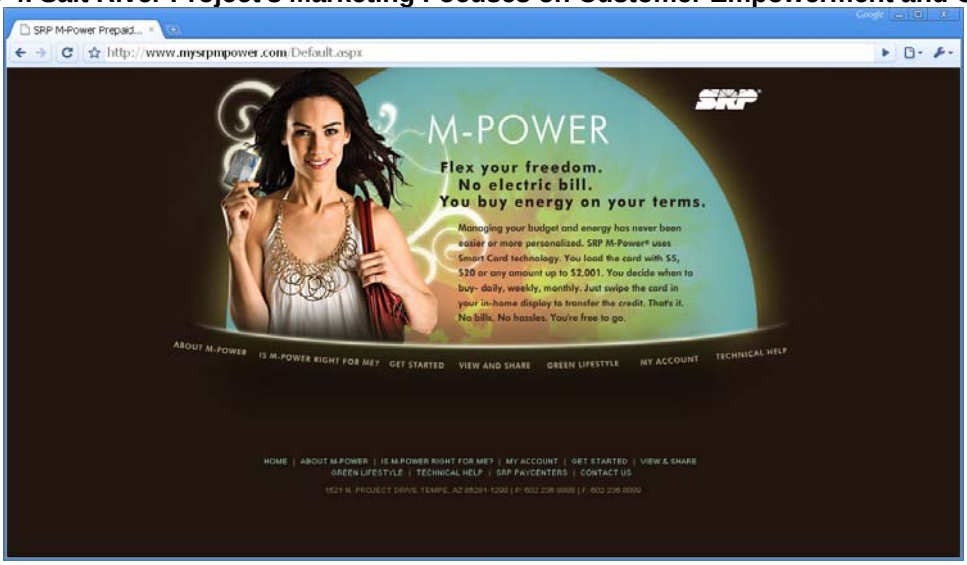
SRP set up an ATM-like system with 70 locations where customers can add credits to "smart cards." These cards function like debit cards. Customers can view their balance—in terms of dollars and time, but not energy units—on a simple in-home display. If a customer runs out of credit during the night or on a weekend, a "Friendly Credit" system gives them a loan—enough credit to last until the morning of the next business day. SRP then subtracts the cost of the energy used during this lag time the next time the customer adds value to the card (SRP 2010a).

By asking customers to pay for the meters via a deposit that is almost completely refundable, SRP has cashed in on the economic concept of "sunk costs" (SRP 2010a). "Sunk costs" is the concept that people tend to be committed to a course of action after they have paid for it (Arkes and Blumer 1985). Asking customers to pay for the meters in advance increases their level of interest in saving energy. Although customers can receive refunds for the in-home display units, it is likely that, with a 90 percent satisfaction rate, there are relatively few refund requests. In effect, SRP is providing a satisfaction guarantee.

SRP markets the program astutely, with an eye to the advantages that metering can provide for customers. The program Web site is customer-focused, was developed using insights from market research, and shows signs of attention to both messaging and market segmentation (Warner 2010). Although the program does not publish demographic statistics about participants, it appears that M-Power has been very effective in reaching a population that is both ethnically diverse and often bilingual (SRP 2010).

This program's marketing strategy, user-friendly design, and ability to reach customers in a range of socioeconomic groups—as demonstrated by its Web site—may have contributed to its success.

Figure 4. Salt River Project's Marketing Focuses on Customer Empowerment and Choice



Source: SRP (2010)

Accomplishments

Start Date	2000
End Date	In progress
Reporting Period for Benefits and Costs	5/1/2008 to 4/30/2009 (fiscal year 2009)
Number of Participants during Reporting Period	77,909
Number of Customers Offered the Option to Participate	Any residential customer may participate
Energy Saved	109,800 MWh
Costs Paid by Program	N/A
Costs Paid by Customers and Others	$99 per household for installation ($87.50 of this deposit is refundable)
Cost-Effectiveness	1.95 (0.57)
Cost-Effectiveness Test	Total Resource Cost test (Ratepayer Impact Measure test)
Non-Energy Benefits	90 percent of customers reported they “believe they use energy more wisely;” 92 percent reported they “like the ability to monitor and control their energy usage.” (The annual report does not list the rate of response for the survey.)
Sources of Data	Surveys; utility energy use data; customer comments

By designing the M-Power marketing program around customer benefits and potential savings, SRP simultaneously accomplished the following goals:

a) Motivating large numbers of customers to invest in meters at relatively high costs (compared to the expectations of other pilot programs);
b) Removing potential barriers by ensuring that the system is convenient and easy to use; and
c) Making energy use both visible and interesting to customers (as the quotes below demonstrate).

Given the high level of customer interest, satisfaction, and investment, it is not surprising the program is cost-effective.

Two data points show that energy savings may be consistent over time; a 2004 study reported 12.8 percent average savings. The study reported energy savings were remaining relatively constant from season to season (Pruitt 2005).

This internal study was designed scientifically, but not published as a full report; the presentation does not mention evidence of persistence. The study used a pre-test, a post-test, and a control group (Pruitt 2005). SRP's fiscal year 2009 annual report does not include persistence data. Recently, the utility has done an internal evaluation of the program each year (Warner 2010).

Behavioral Measures and Customer Responses

Although none of the reports or presentations from SRP mention Community-Based Social Marketing, SRP appears to be following some of the principles of that approach. Some signs of this include M-Power's attention to the needs of specific groups of customers, its removal of barriers to action, and its emphasis on customer benefits (McKenzie-Mohr 2010).

The M-Power Web site contains videos of customers commenting on their positive experiences. These videos are an example of a commonly used persuasive technique called "Social Proof"—showing that people similar to one's audience have taken action (Roberts 2010).

The Web site also communicates a positive self-concept to SRP's customers. The message, paraphrased, is that this program will empower customers by putting them in control of their energy bills. Previous research on behavioral programs for energy efficiency suggests that connecting positive actions with self-image could engage customers (Ehrhardt-Martinez, Laitner & Keating 2009).

M-Power has gained momentum with customers and has expanded gradually. Although many metering programs have reported customers are unwilling to pay for the full cost of a meter installation, M-Power has demonstrated that customers can be both interested and motivated, given the appropriate marketing approach.

The program's user-friendly approach may be related to its customer satisfaction ratings, which were above 90 percent in fiscal year 2009. Customers reported high levels of satisfaction with the in-home meters and their improved ability to manage their expenses. The program Web site includes many comments from satisfied customers; selected quotes appear below (SRP 2010).

"The one thing that I like the most...is that you know how much you are spending per day, so you can cut down on what you're using to save power and energy."

"[The children] seem to pay more attention to leaving the lights on... They're more conscious... Now the box gives them a visual and they seem to appreciate it more."

"M-Power helps me control my electric bill. I can tell how much I'm spending or saving during the week or month. It helps me stretch my money farther. Getting a bill at the end of the month was too much. Now I control my spending."

"Oh, I would definitely promote M-Power to anybody—my friends or my family… it's just so easy to track, so easy to monitor…"

"It keeps me on track… I know what I'm using and what I'm not."

At least one nonprofit organization found that the program realigned incentives for low-income customers.

"We're a non-profit with HUD as a funding source. Before M-Power, it was not a good experience because Save the Family is required to pay the electric bill. It was difficult to get clients to not stand

with the refrigerator door open, or the outside door that let in heat. Now we give clients a smart card and they monitor their usage and make the power last. M-Power changes our clients' behavior."

– Janice Parker, Executive Director, Save the Family Foundation (cited by Pruitt 2005)

Outlook

Salt River Project plans to expand this program and anticipates it will save 208,799 MWh in 2015 (SRP 2009). (This total is yearly, not cumulative.) The utility has been interested in smart metering for some time and plans to use wireless technology for the next generation of meters. This will allow customers to add credits online (Metering.com 2009).

Case Study 6: Real Time Monitoring Pilot, Hydro One, Ontario, Canada

Background

Hydro One designed this pilot program thoughtfully, paying attention to causes, effects, and persistence. The utility designed and delivered the program and hired a third party to evaluate it. The participants all owned single-family homes. The utility compared their previous energy use with their energy use during the study. The evaluation showed an average energy savings of 6.5 percent. The study accounted for weather and compared the participants to control groups of other customers in the same regions (Mountain 2006).

The pilot program was purely informational. Beyond introducing the in-home displays, the utility used no additional behavioral measures, marketing or education. The goal was to "assess whether real-time feedback is effective and to determine from usage data if change in behaviour of the participants could be quantified as energy savings" (Mountain 2006).

The program report explains that Hydro One chose not to include other interventions in a deliberate attempt to keep the results conservative. The evaluation report noted that adding incentives could increase savings (Mountain 2006). More attention to customer benefits and behavioral tools could lead to similar results.

After the pilot program, Hydro One went further, introducing metering with weekly feedback and time-of-use rates on a large scale. As part of that effort, the utility developed a Web site to promote the new metering system (Figure 5). Customers can click on images of appliances in a house to determine the energy they can save by altering their behavior. The site includes customer tips. The sections of the site that describe why smart meters are important—and how they work—focus on utility benefits to a greater extent than one might expect (IESO 2010).

The experimental design of this program could serve as a model for other programs. However, since the pilot relied on the feedback device alone, with little supporting information, the results cannot be extrapolated to programs that use more sophisticated behavioral interventions. Greater attention to "selling" the benefits of metering to customers could add to the results that programs like this can achieve. Now that Hydro One is marketing the program more actively, the resulting energy savings may change.

Figure 5. After a Successful Pilot Program, Hydro One Used this Site to Introduce Residential Customers to Smart Metering with Weekly Feedback

Source: IESO (2010)

Accomplishments

Start Date	7/2004-9/2004
End Date	9/2005
Reporting Period for Benefits and Costs	7-9/2004 to 9/2005; the pre-test data came from the same customers over the previous 18 months. The starting date varied between 7/2004 and 9/2004.
Number of Participants during Reporting Period	382 participants; 42 in control group
Number of Customers Offered the Option to Participate	500 participants; 52 in control group (there were multiple factors responsible for reducing the sample size; this was not a simple “opt-out”)
Energy Saved	6.5 percent of the kWh used per household, on average
Costs Paid by Program	N/A
Costs Paid by Customers and Others	N/A
Cost-Effectiveness	Not reported
Cost-Effectiveness Test	N/A
Non-Energy Benefits	N/A
Sources of Data	Billing data; surveys; power cost monitor data

This program sets a solid precedent for other pilot programs in many ways, including its duration, experimental design, and relatively large and geographically diverse population. The pilot program results provide evidence that using in-home display monitors can yield promising results, even without other behavioral measures. However, since results from other such pilots have varied, more research on causes, effects, and persistence is needed. Our research did not show any publications demonstrating the persistence of these results after this study was complete.

Homeowners with electric heating were much less responsive to the display information than other homeowners were. Since electric heating is a large fraction of home energy use during the winter in Ontario, customers with electric heating may have seen less-than-impressive results when they attempted to save energy. Participants with electric heating were less satisfied with the program than the other customers were (Mountain 2006).

Customers were relatively satisfied with the displays and took a moderate interest in reading them. 38.9 percent of the survey respondents read the displays at least once a day. 24.3 percent of them read the displays less frequently than once a week. 65.1 percent of them planned to continue using the monitors once the study was over. 63 percent of them rated the display's effectiveness in helping them save energy between a 3 and a 5 (on a 0-to-5 scale with 5 as the maximum) (Mountain 2006).

Customers continued to read their displays throughout the year; there was no significant drop in energy savings. All of the participants had at least one year of recorded data during the program (Mountain 2006).

Behavioral Measures and Customer Responses

This program did not incorporate many behavioral measures; it relied on customer interest and curiosity. Customers did respond to the new information, but their interest level—as measured by the frequency with which they viewed the displays—was moderate.

Since the program's success depended on making energy use visible, it may not be surprising that customers whose electric heating load eclipsed the performance of their appliances saved less energy than other customers did. Since the displays did not report results for individual appliances, it was difficult for customers with electric heating to see the results of their actions (Mountain 2006). Customers who use electric heating may need additional assistance with identifying ways to save energy. There are many actions they can take to reduce their energy use.

The utility produced marketing materials later, once it introduced metering and weekly online feedback for all of its residential and small commercial customers. As of 2010, though, the marketing materials and Web site show little attention to customer benefits beyond ensuring reliable electricity and saving money. The "Getting Smart about Smart Meters Answer Book" and the "10 Smart Meter Lane" Web site also mention environmental benefits briefly (IESO 2010; Hydro 2009). "10 Smart Meter Lane" mentions "improved system efficiencies" as a benefit (IESO 2010). Although system efficiencies are clearly important to utilities, customer interest in that subject is likely to be minimal.

Outlook

Hydro One has now initiated a program that combines smart meters, Web-based feedback, and time-of-use rates. This program covers its entire residential and small commercial customer base.

Industry

Case Study 7: Make an Impact Initiative, Alcoa, United States and Australia

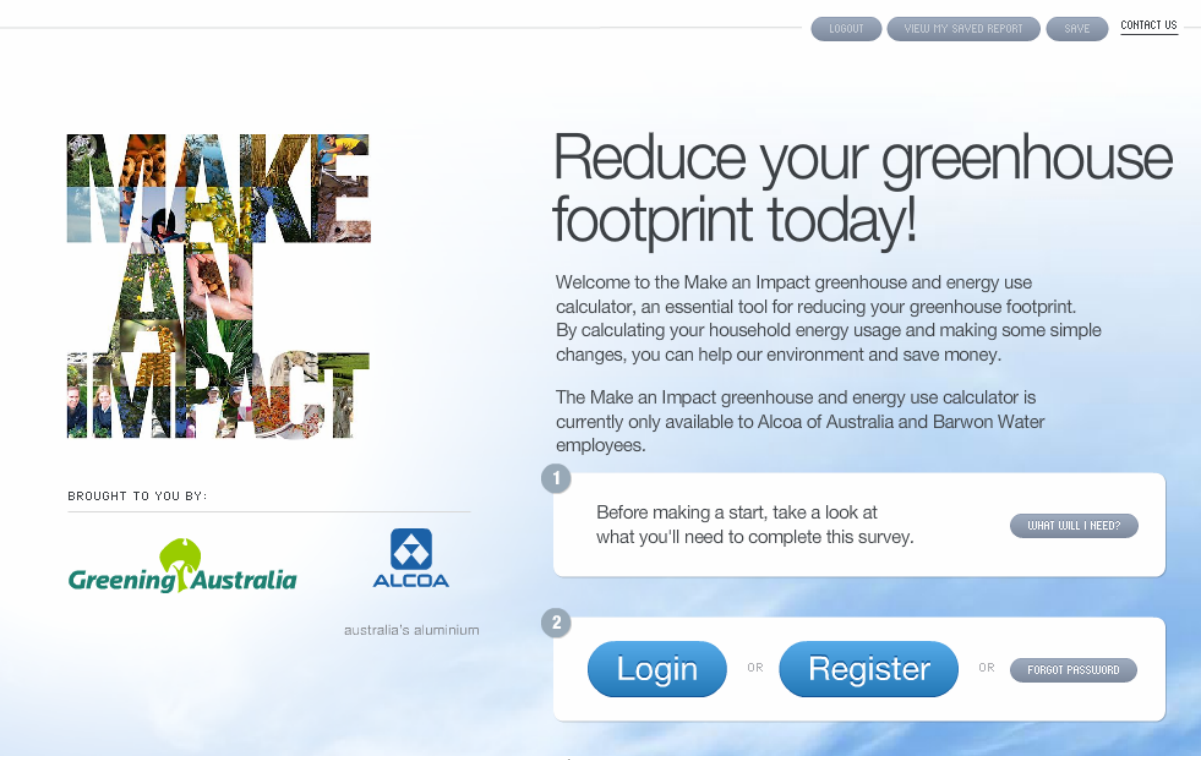
Background

Beginning in 2006, Alcoa—in partnership with Greening Australia and the Alcoa Foundation—launched a global employee and community engagement initiative, "Make an Impact." This initiative raises employee awareness that energy and water efficiency is part of the solution to climate change. The tagline is "save energy, save money, save the planet." This initiative builds on two motivations: saving money and improving the environment.

The initiative has four primary elements:

- employee-shaped initiative
- home greenhouse footprint calculator (see Figure 6)
- resource-rich Web site (http://www.alcoa.com/makeanimpact/australia/en/home.asp) (Alcoa 2010)
- outreach workshops for employees and their communities

Figure 6. *Make an Impact* Greenhouse Footprint Calculator



Source: Make an Impact 2010

Alcoa's president and CEO Klause Kleinfeld empowers employees to take "grassroots ownership" of the initiative. Alcoa employees help shape the initiative and are instrumental in its ongoing deployment. The concept is that as employees make changes to their household energy use, efficiency becomes a way of life. This behavioral change also encourages them to save energy at work. The company has identified the key benefits for Alcoa to be:

- Helping to make Alcoa an employer of choice
- Engaging workers in efficiency in the workplace
- Building bridges and helping to establish "Green Teams" at the Alcoa facilities
- Empowering employees to become community ambassadors for energy efficiency

The initiative was initially launched in eight Australian cities. The company extended the program to the United States in 2008, with a public launch in twelve cities in 2010. As of March 2010, over 1,000 Australian Alcoa employees are engaged in the initiative. The company has a goal of engaging 40 percent of Alcoa's North American workforce by mid-2011.

Accomplishments

Start Date	10/2006
End Date	Continuing to present
Reporting Period for Benefits and Costs	10/2006-03/2010
Carbon Dioxide Reduction	4 million pounds
Costs Paid by Program	Program does not pay incentives
Costs Paid by Customers and Others	Not available
Non-Energy Benefits	The primary focus of the program is carbon reduction, with energy efficiency as the primary strategy. Alcoa also hopes to reduce operating energy and improve productivity as a result of increasing employee awareness.
Sources of Data	Archell (2010); Alcoa (2010)

As of spring 2010, the initiative reports that it has prevented the emission of 4 million pounds of carbon dioxide and saved an average of $US 1,400 per employee family. Alcoa has also launched an "impact tracker" to capture program participant actions (http://alcoa.pewclimate.org/about/ImpactTracker) (Alcoa-Pew 2010). While Alcoa has not attempted to quantify the savings from greater employee sensitivity in the workplace, it views this initiative as an integral part of its corporate strategy for achieving its sustainability targets. These targets include reducing the energy intensity of its primary aluminum production operations by 10 percent by 2020 (15 percent by 2030) from a 2005 baseline and reducing the energy intensity in all other businesses by 20 percent by 2020 (30 percent by 2030).

Behavioral Measures and Customer Responses

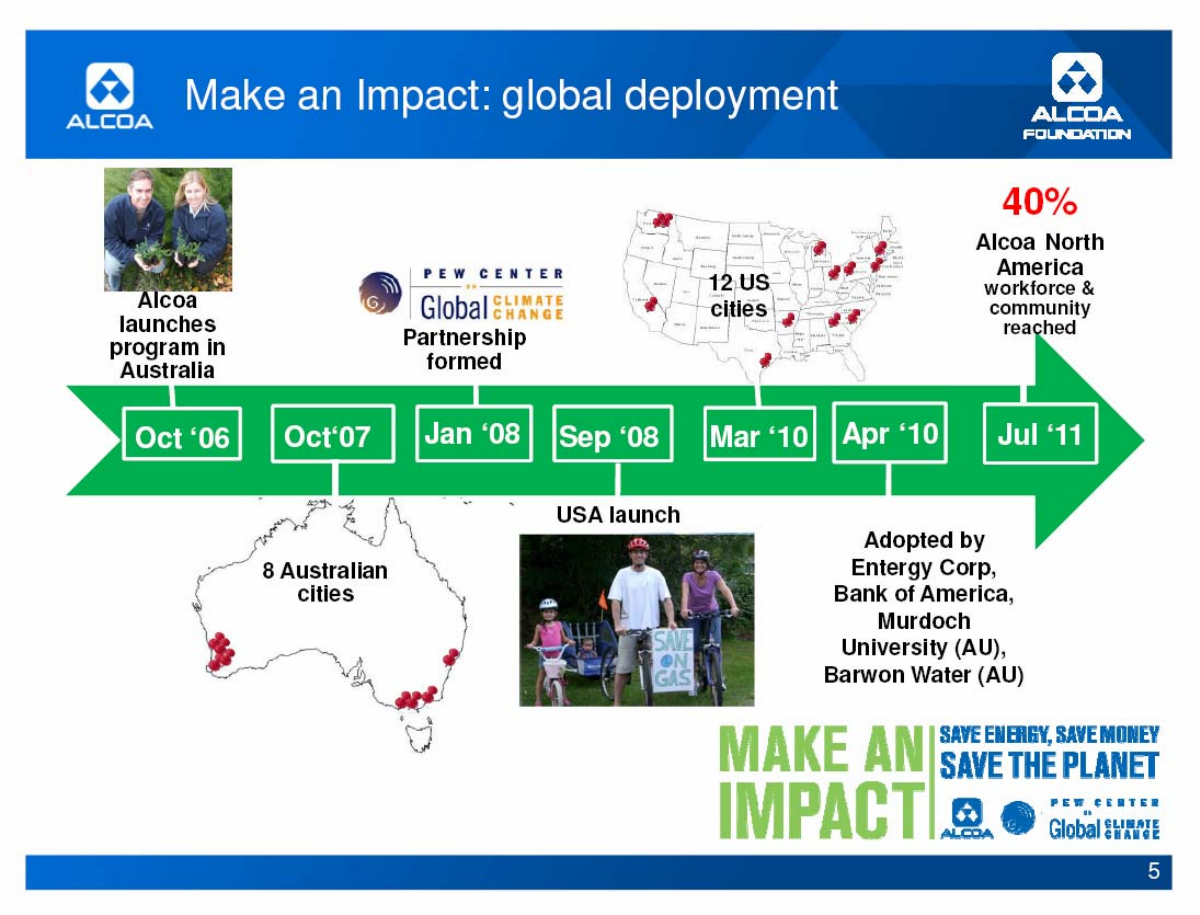
Alcoa cites top-down leadership, grassroots ownership, "walking the talk", working with a credible independent partner, and using a localized approach as the main reasons for its success.

A number of different behavioral measures were used to engage employees in reducing energy use. The program uses a central Web site that contains tips and resources for reducing energy bills, including a carbon calculator with best practice-based individual carbon "footprint" analysis and planning. These Web tools are augmented by an outreach program with educational workshops and local hands-on activities. In addition, the program provides a framework that leverages social networking to share energy savings ideas (http://alcoa.pewclimate.org/about/3-words) (Alcoa-Pew 2010).

Outlook

Alcoa and the Alcoa Foundation are now looking to expand the program throughout their global operations and are actively working to extend the program to other companies. In 2010, Entergy Corp., Bank of America, Murdoch University (in Australia), and Barwon Water (in Australia) joined the initiative (see Figure 3).

Figure 2. *Make an Impact* Deployment Plan (



Source: Archell (2010)

Case Study 8: Corporate Energy Management as part of Dow's Overall Corporate Sustainability Commitment, The Dow Chemical Company, Global[7]

Background

The Dow Chemical Company offers numerous insights and best practices in corporate energy management. Dow has shown a commitment to energy savings at the corporate level by meeting goals and establishing new ones. Managers have spent decades seeking to reduce their energy intensity and making energy a key metric of company performance. Their motivation is no surprise: about half of Dow's total revenues are spent on energy. This is atypical in manufacturing; on average, energy costs account for only about 2 percent of sales. A large part of Dow's energy purchases consist of natural gas that is used as feedstock for chemical products. Dow is notable for not just setting and meeting aggressive energy savings goals, but for doing so consistently for such a long time.

In 1995, Dow decided to reduce its energy intensity, measured in millions of British Thermal Units (mmBtu) per pound of product, by 20 percent by 2005. When the company reached that goal, it set an even more ambitious goal: a 25 percent reduction by 2015. Similarly, Dow has pledged to reduce its greenhouse gas intensity, measured in pounds of carbon dioxide equivalent per pound of product, by 2.5 percent per year. Since 1990, Dow has reduced its absolute greenhouse gas emissions by

[7] Note: sources for this case study are Dow (2010) and Prindle (2010).

more than 20 percent and cut its energy intensity by 38 percent. The company has sustained savings over a 10-year period and then strengthened the target for another 10 years.

It is important to note that natural gas used as a feedstock does not emit greenhouse gases. Thus, reducing feedstock energy use does not impact the greenhouse gas goal, although it does contribute to the energy goal.

The Dow Chemical Company sets aggressive energy intensity reduction goals and meets them by incorporating energy management into every level of the company. The company leverages its energy business unit to provide a wide range of energy efficiency and related technology and operations services.

Accomplishments

Start Date	1994
End Date	2015
Reporting Period for Benefits and Costs	1994-2010
Energy Saved	1,700 trillion Btus of energy
Costs Paid by Program	Not available
Costs Paid by Customers and Others	Not available
Non-Energy Benefits	Operating cost savings of $8.6 billion; 86 million metric tonnes of CO_2e saved
Sources of Data	Dow (2010); Prindle (2010)

Data through 2008 shows that the company is on track to meet its current goal, not counting preliminary 2009 intensity levels, which spiked due to reduced production during the economic downturn.

Behavioral Measures and Customer Responses

Dow is able to meet its goals by fully integrating energy management into its corporate management structure. Dow expressed this leadership commitment by announcing its 2015 energy goal at a special event in Washington, D.C., instead of issuing a press release. This high-profile, high-level engagement influences Dow's entire management chain including business, site, and plant managers. Dow has an entire business unit devoted to purchasing, delivering, and managing energy, with an Energy Efficiency and Conservation (EE&C) program included within the unit. The program involves about 40 individuals from throughout the company. EE&C staff work with management and operations at business units, sites, and plants to help identify and implement efficiency improvements. They are also active within Tech Centers in each business unit, working with technology experts to develop process improvements. This arrangement not only yields practical solutions to the complex problems of adjusting process equipment, but builds trust with site staff and makes it easier to "sell" the energy efficiency improvements.

In addition to involving management and operators at all levels of the company, Dow also regularly turns to a panel of outside experts to broaden its knowledge base and incorporate best practices.

An important aspect of Dow's energy management strategy—and of energy management in general—is robust data collection. The company's Global Asset Utilization Reporting (GAUR) monitors and collects data from many locations in each plant and adds them up through each site and business unit, accounting for energy use throughout the company from the bottom up. This performance tracking allows energy managers at multiple levels in the company to manage energy use while planning and measuring results from energy efficiency projects.

Outlook

Dow's current energy saving goal extends through 2015. Given the company's track record of meeting long-term goals and setting new, more ambitious ones, along with how well the company has internalized energy efficiency in its management structure, it is likely that Dow will continue to set energy intensity goals in the future.

Transportation

Case Study 9: SmartWay Transport Partnership, Environmental Protection Agency, United States

Background

The Environmental Protection Agency's SmartWay Transport Partnership is a public-private partnership that promotes greenhouse gas reductions and energy efficiency in goods movement across the supply chain. SmartWay aims to reduce the impact of freight transportation on the environment by improving vehicle and system energy efficiency and reducing emissions of carbon dioxide and criteria pollutants such as nitrogen oxides and particulate matter. SmartWay partners include a host of freight shippers, carriers, and logistics companies (EPA 2010).

SmartWay aims to move companies toward sustainable practices through:

- tools and resources allowing partners to assess, track, and reduce their emissions and energy use
- innovative financial mechanisms to expand access to cleaner technologies
- identification and testing of lower-carbon strategies and technologies
- recognition for top-performing partners

The program employs a number of behavior-based strategies in addition to providing inventive financing options for equipment upgrades. SmartWay has helped to establish low-interest loan programs to help companies with less access to capital—for example, smaller trucking companies—purchase new or used trucks with superior efficiency and emissions performance.

Carriers that achieve a certain threshold score for the environmental performance of their fleets earn the privilege of affixing a SmartWay logo to their Web sites and other publications. Shippers qualify to use the logo by employing SmartWay carriers to handle the majority of their freight. These labels not only indicate to the broader public the level of action taken by shippers and carriers to save energy and reduce emissions but also allow comparison between service providers and stimulate competition. Manufacturers that produce SmartWay-certified tractors or trailers are eligible to mark their products on the interior with EPA's official certification sticker (EPA 2010). Carriers that operate these vehicles and commit to sustaining their fuel-saving performance through proper maintenance and component replacement can display the SmartWay certification label on the exteriors of their certified vehicles.

The simple behavioral elements included in EPA's SmartWay program are easily replicable, particularly at the state level. States could potentially implement their own "SmartWay-like" freight efficiency projects that provide low-interest funding for efficiency retrofit kits and upgrades while encouraging competition among fleet owners.

Accomplishments

Start Date	February 2004
End Date	n/a
Reporting Period for Benefits and Costs	February 2004 to present
Number of Participants during Reporting Period	2,600 partner companies
Number of Companies Offered the Option to Participate	All shippers, carriers and logistics companies
Energy Saved	1.5 billion gallons of diesel
Non-Energy Benefits	CO_2 savings: 14.7 million metric tons
Sources of Data	EPA (2010); Bynum (2010)

To date, six tractor manufacturers and nine trailer manufacturers have signed on with EPA to produce SmartWay vehicles. This is in addition to the number of equipment manufacturers whose efficiency products are employed on SmartWay trucks. Over the course of six years, SmartWay has signed up 2,600 partners who have committed to reducing energy use and overall emissions. The program has saved approximately 1.5 billion gallons of diesel and 14.7 million metric tons of carbon dioxide to date (Bynum 2010). The cost of the program to the government is modest relative to these savings. Furthermore, the efficiency technologies employed pay back their upfront costs in fuel savings in a short time, making the SmartWay Transport Partnership a highly cost-effective way to create efficient truck fleets and reduce overall fuel consumption and greenhouse gas emissions (Blanco & Tan 2009).

Behavioral Measures and Participant Responses

EPA's SmartWay program has been a popular program since its inception, thanks largely to the fact that it provides trucking companies with a way to improve and advertise their environmental performance while reducing their fuel costs. Fuel is one of the largest expenses for most trucking companies and, in light of recent price volatility, a major concern for operators who are already facing the economic downturn.

The labeling component of the SmartWay program encourages and rewards competition among freight shippers and carriers to achieve the greatest reduction in fuel consumption and emissions. The label sends a message to competitors, customers, and the public that trucking companies are taking action to save energy, reduce emissions, and protect the environment. Likewise, the SmartWay Excellence Award recognizes partners who have gone above and beyond the requirements of the program to improve the efficiency of their services and reduce their environmental impact.

The SmartWay program helps companies take advantage of energy efficiency opportunities. Through a variety of low-interest loans and grant programs, SmartWay encourages companies with trucking fleets to outfit their vehicles with a range of technologies such as efficient tires, emissions control devices, and auxiliary power units to reduce fuel expenditures and environmental impact.

Outlook

SmartWay is currently in its sixth year of operation and will be likely be part of EPA's long-term efforts to reduce national greenhouse gas emissions and fuel consumption. SmartWay-like programs could potentially develop at the state level as a companion to the federal program; ACEEE has recommended this approach in several state energy efficiency potential analyses as a way of capturing additional heavy-duty diesel savings and emissions reductions.

SmartWay plans to shift to a system of vehicle designations based on performance rather than on equipment specifications. The program is also considering expanding its tools for fleet savings tracking to extend beyond trucking (EPA 2010).

Case Study 10: Feebate Program, France

Background

In December 2007, France adopted a "bonus/malus," or feebate, program to promote the purchase of low carbon dioxide vehicles. Given that almost all vehicles sold in France are petroleum-fueled, there is nearly a direct correspondence between vehicles' carbon dioxide emissions and their energy consumption. Participating dealers deduct rebates from the purchase prices of the vehicles; otherwise, the purchasers submit the receipts directly to the government for reimbursement. Any fee is an additional tax collected at the time of registration (MEEDDM 2010a).

The program is intended to shift the car market in two ways: by motivating manufacturers to produce more efficient vehicles and by motivating consumers to choose those vehicles. In 2008, the government offered bonuses of up to 5,000 euros for the purchase of low-emitting vehicles (though none qualified for this highest bonus), while charging fees as high as 2,600 euros for the purchase of high-emitting vehicles. Between these two ends of the emissions spectrum, there were seven additional carbon dioxide emissions "bins," with declining rebates/increasing fees as vehicles' emissions increased. The schedule of rebates and fees for 2008 is below.

Table 1. Schedule of Rebates and Fees for 2008 in France

CO_2, g/km	Rebate (-) / fee (+), euros
< 60	-5000
61 to 100	-1000
101 to 120	-700
121 to 130	-200
131 to 160	0
161 to 165	200
166 to 200	750
201 to 250	1600
> 250	2600

Source: MEEDDM (2009)

An additional bonus of 300 euros was awarded to those disposing of vehicles more than 15 years old and purchasing vehicles eligible for rebates.

In its first year of operation, the program resulted in a greater decline than expected in average carbon dioxide emissions of vehicles sold. Determining the effect of the program is not altogether straightforward, because several factors contributed to a decline in new vehicles' emissions in 2008. The French Ministry of Economy, Energy, Sustainable Development and the Ocean (MEEDDM) calculates, however, that at least half of the 9 grams CO_2-per-kilometer decline in average emissions of vehicles purchased in France in 2008 was due to the program (MEEDDM 2009). That implies that the feebate program decreased the average energy consumption of vehicles sold by at least three percent.[8]

The benefits of the feebate would be expected to grow in subsequent years. Much of the effect of the program is likely to be the response of manufacturers, who will invest more in the efficient vehicles promoted by the feebate (Bunch and Greene 2010). This manufacturer effect would take years to materialize. The immediate response to the feebate largely reflects consumers' shifts in preference among the vehicles already available.

[8] A subsequent assessment concluded the programs reduced emissions by 5 percent (Bunch and Greene 2010).

We selected this program because feebate programs are regarded as potentially effective complements to, or even substitutes for, vehicle efficiency regulation. Vehicle manufacturers have historically claimed that fuel economy regulation is fundamentally disruptive of the vehicle market, because consumers have little incentive to choose high-efficiency vehicles. A feebate provides this incentive, better aligning consumer preferences with manufacturer requirements. Although there have been several attempts to adopt a feebate at the state and federal levels in the United States, no such program has been implemented here yet.

Adopting a program like France's in the United States would be straightforward from a technical perspective, but previous experiences highlight the political challenge of doing so here. On the other hand, a feebate generally would be expected to produce greater results, on a per-vehicle basis, in a larger vehicle market, because manufacturers will react more strongly to a program covering a larger consumer population.

Accomplishments

Start Date	December 2007 (bonus), January 2008 (malus)
End Date	December 2008 (end of analysis, not program)
Reporting Period for Benefits and Costs	Benefits: 15 years (lifetime of vehicles purchased) Costs: 2008 (time of purchase only)
Number of Participants during Reporting Period	2,050,283 (all new vehicle purchases in France, 2008)
Number of Consumers Offered the Option to Participate	2,050,283 (not an opt-in program)
Energy Saved	163 million gallons over 15 years
Costs Paid by Program	235 million euros
Costs Paid by Consumers and Others	Net negative*
Cost-Effectiveness	€1.44 per gallon**
Cost-Effectiveness Test	Program + consumer purchase cost per gallon saved
Non-Energy Benefits	CO_2 savings
Sources of Data	MEEDDM (2009)

* The more efficient vehicles purchased presumably cost more than the vehicles that would otherwise have been purchased (though these additional costs would be less than the resultant savings on fuel expenditures). On the other hand, consumers as a whole received a 235 million euro net subsidy from the French government. We estimate that the vehicle costs increases were at most 180 million euros, so net consumer purchase cost increases were negative.
** Equivalent to $1.93 given the exchange rate on 4/20/2010.

Central to the evaluation of program performance is the question of how much of the decline in average emissions of new vehicles was attributable to the incentive program. France, along with other EU countries, has experienced steadily increasing sales share for diesel vehicles, reaching 77.3 percent of sales in 2008. Diesels typically emit less carbon dioxide than comparable gasoline vehicles, due to their greater intrinsic efficiency. In addition, economic conditions likely led consumers to place a higher value than usual on fuel savings in choosing vehicles for purchase. MEEDDM estimated the contribution of the feebate to the decline in average emissions by comparing the percentage decline in France with average emissions declines in neighboring countries, where no such program was in place. It concluded from this comparison that at least one-half of the decline in average emissions in France was due to the feebate program.

With regard to the relatively high cost of the program to the government, it should be noted that this is not an intrinsic feature of the scheme. Feebates can be designed to be nearly "revenue-neutral" (having no net cost to the implementing party). Achieving this outcome relies upon correctly anticipating how consumers will respond to the program and setting the schedule of fees to generate revenues from the purchase of less efficient vehicles sufficient to offset government outlays for the purchase of more efficient vehicles. France appears to have underestimated the decline in new vehicle emissions in 2008, which resulted in a high cost for the program.

For 2010, the schedule of fees and rebates has shifted upward, as shown below.

Table 2. Schedule of Rebates and Fees for 2010 in France

CO_2, g/km	Rebate (-) / fee (+), euros
< 60	-5000
61 to 95	-1000
96 to 115	-500
116 to 125	-100
126 to 155	0
156 to 160	200
161 to 195	750
196 to 245	1600
> 245	2600

Behavioral Measures and Customer Responses

This program provides a financial incentive for the purchase of more efficient vehicles. For several reasons, however, it is of interest as a program to shift behavior:

a. A commonly cited reason that consumers choose vehicles less efficient than what is justified by potential fuel savings is that they do not fully value those savings when choosing a vehicle. A feebate increases the salience of a vehicle's energy efficiency by highlighting fuel savings at the time of purchase. This is one way of making energy use more visible to the public.
b. A major objective of the program is to induce manufacturers to produce more efficient vehicles. While manufacturers do not gain or lose funds directly from the consumer fee or rebate, they will seek to keep their vehicles competitive. This competition will influence manufacturers' advertising strategies.
c. France has used the European Commission label showing carbon dioxide emissions of new vehicles in grams per kilometer since 2006. Tying the information on the label to a monetary incentive is likely to produce greater results than either the label or the incentive alone would achieve.

Figure 8. European Commission Vehicle Label

Source: ADEME (2010)

Outlook

France's bonus/malus program is now in its third year. The program already covers all new vehicles, but the government is considering expanding the program to certain appliances (ASE 2010). Several countries already have similar programs in place and other countries in or outside the EU might choose to adopt the program based on the experience of these leaders (Bunch and Greene 2010).

In the United States, there have been numerous attempts to adopt a feebate program, but none has yet succeeded (Langer 2005). At the state level, the most recent concerted effort was in California, where legislation was introduced in three successive sessions but did not pass. Subsequently, the state listed a feebate as a possible measure to implement AB 32, California's global warming law. The state funded a study of feebates, for which interim findings were recently released (Bunch 2010). At the national level, feebates have been included in Senate bills introduced in 2009 (S.1620) and 2010 (S. 3464). Additional potential legislative vehicles include the energy and climate bills under consideration in Congress.

RESULTS AND RECOMMENDATIONS

This review of selected programs allows us to take a broader perspective and discuss what these programs have accomplished and how these achievements could translate into expanded goals. As we look at opportunities to scale up energy efficiency work throughout the United States, there are program types that seem promising and approaches that might yield considerable increases in energy savings, if adopted on a larger scale. However, there are still many questions about what these programs can accomplish. The case studies we examined illustrate what is possible, but this is a small, selected set of programs. Questions remain about scaling these programs up to reach larger customer populations and achieve persistent savings.

Several caveats apply throughout the following section. First, comparing savings percentages across programs of such widely divergent types would be a gross over-simplification and would be of limited value in trying to assess the possible role of more widespread implementation of behavioral approaches. There are too many variables at work, many of which have not been identified by the programs themselves, for us to be able to identify specific factors and identify their expected effects on savings, particularly if programs are scaled up to much larger customer populations. Second, it is premature to say that we are aware of the cause-and-effect relationships that are at work. Observed savings are generally only measured at the aggregate level—over an entire group of participants. Understanding which customer activities resulted in specific levels of savings is an area of research that should be greatly expanded. Acknowledging the need for more research, the conclusions below provide a road map for further exploration and summarize our qualitative and quantitative observations from this review.

Visibility

Visibility is central to behavior change in all sectors—whether programs accomplish this through Web sites, in-home displays, pay-as-you-go programs, advanced billing, corporate energy management, labeling programs, or media campaigns. GroundedPower's discovery that energy savings correlated with customers' visits to the Web portal, not their self-reported activities or attitudes, suggests that visual reminders can have this effect (PAC 2010). Some customers are curious about their energy use; this can motivate behavior change, even without attention to the other factors outlined below (PAC 2010).

- **Web Sites and In-Home Displays**: Making electricity use visible via in-home displays or the Web can yield significant energy savings. Hydro One's in-home display program reported 6.5 percent savings (Mountain 2006). Another program that added behavioral measures and improved its marketing reported slightly higher savings (PAC 2010). While some other well-

designed pilot tests in the United States have produced smaller savings than the Hydro One pilot did, this technology appears worthy of further research.

- **Pay-as-You-Go Programs**: The Salt River Project pay-as-you-go program reached the highest levels of savings of the residential energy programs examined in this report—12 percent—and included marketing and user-friendly design. However, it is not clear which factors and specific customer actions led to this program's success (SRP 2009). The "pay-as-you-go" requirement may be regarded as controversial by some stakeholders.

- **Advanced Billing Programs**: OPOWER's billing-only approach in Sacramento, which does not use an in-home display or a Web interface, yielded 2.4 percent savings (Ayres, Raseman & Shih 2009). More research is needed on the dynamics of how customers respond to this information and what specific customer actions lead to savings. But this type of information strategy appears promising.

- **Corporate Energy Management Programs:** These programs make energy use visible by tracking it in the same ways that companies track product quality and other performance goals. Tying visibility to accountability is a logical step; we discuss goal setting later in this section.

- **Labeling Programs**: Attaching performance labels to products is another way to increase the visibility of energy-efficient behavior. The SmartWay program uses labels to show that trucking companies are making environmentally sound decisions (EPA 2010).

Some programs show that reminders, as well as visibility, can be useful. Salt River Project's pay-as-you-go program reminds customers of their energy use and its costs regularly (SRP 2010). Ford Motor Company's "instant readout" technology—which is currently under development—reminds drivers of their energy use whenever they are at the wheel. The Toyota Prius has had this feature for nearly a decade.

Evaluation and Design of Utility-Sector Programs

Reporting energy savings makes program successes more visible to decision makers, just as in-home displays make energy savings more visible to homeowners. Accurate evaluation increases the funding and credibility of behavioral programs.

Although this review does not focus on evaluation methods in detail, utility-sector behavioral programs' success typically hinges on their ability to demonstrate and quantify energy and cost savings to regulators. These programs have encountered some resistance for regulatory approval and associated cost-recovery due to the view that "if energy savings can't be quantified, they don't exist." However, evaluation research shows that behavioral program savings can be quantified, although most states are not doing so yet (Skumatz, Khawaja & Colby 2009).

Experimental Methods

The quality and accuracy of these results will depend on using sound experimental design (Faruqui & Sergici 2010). These experimental designs require that programs plan evaluation strategies in advance (Cowan 2010; Skumatz, Khawaja & Colby 2009). Scientifically-designed pilot programs use random selection, analyze the effects of secondary variables, use control groups, and compare pre-test and post-test results (Faruqui & Sergici 2010; Sullivan 2009). When program developers choose not to select participants at random, they may use quasi-scientific experimental designs (Sullivan 2009).

For utility-sector programs, we recommend designing studies with adequate sample sizes. Participants should be selected so as to be unbiased and representative of the intended customer

population. We recommend using experimental designs such as those outlined by Sullivan (2009), extending the duration of pilots beyond one year to examine persistence, and relying on energy use data rather than self-reported behavior changes. Skumatz, Khawaja and Colby (2009) recommend collecting persistence data for three years or more. Extending pilot programs need not delay behavioral research, though. Lutzenhiser et al. (2009) proposed supplementing experimentally designed pilots with market transformation pilots in which programs adjust their approaches dynamically based on evaluations. Similar ideas are already in use in other environmental fields (Lutzenhiser et al. 2009).

We recommend using caution when comparing smaller pilot programs to larger ones. Although reporting energy use on an appliance-by-appliance basis can be valuable, it is also relatively expensive with current technology (Ehrhardt-Martinez, Donnelly & Laitner 2010). In a recent review of advanced metering, all of the appliance-specific studies cited in the appendix used sample sizes of less than 75 households (not counting control groups) (Ehrhardt-Martinez, Donnelly & Laitner 2010).

Surveys

Evidence of energy savings can increase support for behavioral programs. In some cases, programs rely on customer surveys rather than energy use data. Survey data are undoubtedly useful, but should supplement energy use information rather than replacing it. GroundedPower's evaluation results showed that customers' reported behavior changes did not necessarily correlate with their actual energy savings (PAC 2010).

Surveys are appropriate for measuring non-energy benefits, which are particularly important in behavioral programs (Skumatz, Khawaja & Colby 2009). As we describe below, non-energy benefits are logical "selling points" for behavioral programs and can play a role in marketing, gaining funding, increasing public support, and expanding participation (McKenzie-Mohr 2010; SRP 2009).

Action Focus

Although non-energy benefits can motivate audiences, attaching marketing to concrete actions remains important. We recommend using media campaigns to promote concrete actions and surveying audiences about these actions. This goes beyond studying public perceptions of the media campaign, attitudes about saving energy, and views of energy efficiency. Ideally, the questions should reach beyond intentions to include actions. Efficiency Vermont's New Bulb in Town campaign collected data on customer plans to purchase CFLs (KEMA 2010a). As noted above, energy use data are also needed, if they are available.

A greater emphasis on actions would help regulators and other decision makers track media campaign performance. To date, many media campaigns have not focused on asking customers about their actions (e.g., CFL purchases). Flex Your Power's recent work may have raised awareness of energy use, but has not directed customers to take concrete actions (Hummer, Firestone & Zentai 2008). There is still considerable work to do in bridging existing evaluation tools and media campaign evaluation methods, even in states where media outreach is common.

Target Data

To the extent that program evaluators can "drill down" to find persistence and cause/effect relationships, we recommend that they do so. Advance planning and scientific experimental design make it easier for evaluators to identify causes and effects (Sullivan 2009). Some programs have been quite thorough in analyzing these relationships, although many have not done so (Mountain 2006). We encourage programs to collect and publish cause-and-effect data.

More published data on persistence would also be valuable (Skumatz, Khawaja & Colby 2009). The programs in this review lasted over one year each. Publishing the results of longer-term studies would benefit both researchers and program designers. It's also critical in assessing the relative role that

behavioral programs can play in meeting long-term energy savings goals that numerous states have adopted (using "energy efficiency resource standards") and other long-term economic and environmental goals.

Social Norms and Networks

We all make decisions about energy use in the context of the communities where we live. We are influenced by both the social norms around us and the views of our friends, coworkers, neighbors, and families. In general, this report recommends approaching energy users as people within a community rather than isolated decision makers and using the appropriate social science strategies to draw on this potential.

Norms

If everyone else is saving energy, why can't we? Social norms messages show utility-sector program participants that their peers are already saving energy. Social norms messages have the potential to backfire if customers see they are already more efficient than their neighbors, so OPOWER uses emoticons (☺ or ☹) as well as a percentage ranking to encourage energy-efficient customers to continue saving energy. However, even with the emoticons added to bills, researchers observed a slight decline in the amount of energy that the most "eco-aware" homes saved (Ayres, Raseman & Shih 2009).

Building Operator Certification creates and supports social norms informally both within the classroom and within the industry. Programs could take this a step further by providing further social support after the courses are complete.

Networks

Programs that use social networks—whether online or in person—find that participants are often eager to share their knowledge. Personal connections give information greater credibility; one well-known example of this is the practice of professional networking. As program participants build their knowledge, they can share energy-saving tips just as readily as they might share work-related information. GroundedPower used social networks in its Web interface; OPOWER has used them also, but more implicitly (PAC 2010; Bukhin 2010; Ayres, Raseman and Shih 2009). The expansion of online social networking offers opportunities in this area.

Lifestyles and Market Segmentation

Research shows that, when one considers energy-efficient behavior, there is no "average homeowner" (Lutzenhiser et al. 2009). Simplifying assumptions can be effective at times, but can also miss the mark—particularly if a program is trying to reach groups that differ from the assumed average.

We recommend engaging in targeted research on demographic and lifestyle variables that influence energy use. Transportation programs could also benefit from further consideration of lifestyles, market segmentation, and demographics when promoting fuel-saving activities to the public.

Selective market research can help programs reach communities very effectively. This is especially true for groups that have limited access to media and/or may fall through the cracks of a "standard" program approach (Ehrhardt-Martinez 2008; Lutzehiser et al. 2009). For example, Flex Your Power's research on Californians' views of energy use revealed that Latinos were very responsive to messages about global warming (ODC 2008).

Although some programs in this review, such as the M-Power program, were attentive to demographic and lifestyle variables, there is much more work that program developers could do to

align pilot program design with these realities. For example, none of the programs in this review addressed gender, although social science research shows that women are often the primary decision makers about energy use in residential settings (Lutzenhiser et al. 2009).

Organizational Cultures

When programs pay close attention to the goals of organizations and their employees, they can increase the depth of their reach and their ability to make efficiency both long term and self-sustaining. Industry-wide programs, such as the SmartWay program for long-distance trucking, match their incentives and measures to business interests (EPA 2010). Programs should attempt to integrate their approaches with companies' norms, networks, and workflows.

The ideas of social norms and networks are already built into the corporate management, corporate social norming, and Building Operator Certification programs we reviewed; in that context, the "community" is the work environment or the larger market. Decision makers adopt energy-efficient practices, transmit these practices through the management structures of their organizations, and involve staff at every level by making energy efficiency part of their organizational cultures. Through corporate sustainability and responsibility initiatives, executives and companies communicate their actions to their peers, business partners, and customers.

Employers also set up ridesharing, transit, parking cash-out, and telecommuting programs and offer employees incentives to participate in them. They may also offer incentives such as preferred parking to staff driving efficient vehicles. Although social norms and networks play an informal role in these programs, the success of programs may depend on corporate culture. Corporate culture determines companies' choice of location, provision of bicycle facilities, and development of other policies to support alternatives to driving (and other energy-saving behaviors).

Industrial programs are completely integrated with the workflows of the companies that build them. This way, energy efficiency becomes part of "standard operating procedure"—similar to quality assurance. Energy efficiency software that fits directly into corporate management software would allow companies to customize their solutions.

Social Status, Certifications, Goals, and Competitions

Participants can gain rewards, acknowledgment, and social status for energy-efficient actions in many ways. Some examples are energy efficiency games (both online and in person); social networks with "promotions" for energy accomplishments; labels that recognize achievements; and professional certifications (Anderson 2010; Bukhin 2010; CSF 2010; PAC 2010; EPA 2010; BOC 2010).

Goals

A number of Web sites, including GroundedPower's pilot program site, offer customers goal-setting options (PAC 2010). Co2gether, a carbon dioxide reduction site hosted by the University of Wisconsin-Madison, takes a comprehensive approach, encouraging local residents to set goals, communicate with each other, and connect their actions to global warming information in Wisconsin (SAGE 2010). Industrial programs engage in goal setting on a corporate level.

Competitions

Organizations, neighborhoods, communities, and individuals take an interest in competition and recognition for energy efficiency. Programs like the Energy Smackdown and the PowerSense Laundry Campaign use competition to motivate participants to save energy (ES 2010; FortisBC 2010).

Social Status

Professional certifications confer social status as well as opening doors to job opportunities (Anderson 2010). Social status and competition also played a role in the SmartWay program and could be integrated into feebate programs for vehicles. Although the social norms messages that OPOWER uses may relate to participants' awareness of status and interest in competition, there is much more that utility programs could to do understand and influence the perceived social status of energy-efficient actions (Ayres, Raseman and Shih 2009).

It would be fair to say that energy efficiency's "unsexy" image, which is often mentioned in the news, may have a great deal to do with its perceived connection to social status (Lutzenhiser et al. 2009). By taking a utilitarian perspective and focusing on incremental savings, programs overlook that customers may want to make a visible statement. The visual statement of owning a Prius could be considered as much a status symbol as a sign of environmental commitment. The perceived lower status of energy efficiency projects such as weatherization may subtly diminish their appeal to the public, businesses, and the media.

From a market segmentation perspective, programs should explore providing solutions across the spectrum to include customers who want highly visible, more expensive measures as well as to customers who are content with less visible choices. One direction for further research could involve correlating the perceived social status of measures with their relative energy savings and identifying opportunities and challenges.

Financial Incentives and Motivation

Research shows repeatedly that, in our everyday lives, people do not follow "rational" economic decision making models (Ariely 2009). We weigh the costs and benefits of taking action; those costs include our time and attention. Changing habits can be difficult. Behaviorally, non-economic motivations are more important than one might expect.

Non-Economic Benefits and Community-Based Social Marketing

Non-economic benefits exist in all sectors, but the relevance of specific benefits depends on the priorities of decision makers—including utility customers—and the structure of organizations. In business settings, companies may prefer to continue an existing process than to invest the time and energy in changing it—even if financial savings are available.

Understanding the benefits that can motivate people and organizations to change their habits is essential if we want to take energy efficiency beyond informational tips and into everyday life (McKenzie-Mohr 2009; McKenzie-Mohr 2010). Community-Based Social Marketing is a systematic and pragmatic approach to increasing the benefits of taking environmental actions and reducing the barriers associated with them. In energy efficiency programs, this approach may increase both participation rates and energy savings. This method, based on environmental psychology, involves

- Exploring what actions will lead to a desired environmental outcome
- Discovering what barriers now prevent people from taking these actions
- Learning what benefits are most interesting to participants (often, these benefits may be non-economic)
- Designing a social science-based intervention that communicates and strengthens the benefits of taking action while minimizing the barriers to action
- Evaluating the intervention and using the data to inform and/or revise one's approach (McKenzie-Mohr 2010)

In this review, attention to non-economic benefits appeared to aid a number of programs. However, since none of the programs measured the effects of financial incentives compared to non-economic

benefits, we can neither quantify this benefit nor predict what results might occur for other programs. Flex Your Power based its messages on research into customer values and motivations; GroundedPower appealed to participants' curiosity about energy use; Salt River Project leveraged many non-financial motives, including self-esteem; and SmartWay provided public relations advantages (PAC 2010; Hummer, Firestone & Zentai 2008; EPA 2010; SRP 2009).

Programs may be able to save money by paying more attention to non-economic motivations. This could be a promising topic for future research. Experiments such as Lutzenhiser et al. (2009) propose could identify alternate motives that both save programs money and increase their value to customers.

Financial Incentives

When programs do offer financial incentives, the size and timing of these incentives make a difference. When setting up financial incentives, programs should make benefits and costs visible in ways that matter to customers. In other words, to make payments more visible, make them large and short term; to make them less visible, do the opposite (Ariely 2009; SRP 2010a). France's Feebate program is one example of this strategy (MEEDDM 2009). When working with industrial customers, consider their fiscal year expectations and accounting methods.

Design and Technology

User-friendly design of Web sites, meters, and correspondence has significant effects on customer interest and participation in behavior change programs. This observation agrees with the perspectives of both social marketing and Community-Based Social Marketing (Smith 2009; McKenzie-Mohr 2010).

During OPOWER's advanced billing program in Sacramento, customers were more responsive to bills with more graphics than to bills with more text (Ayres, Raseman & Shih 2009). GroundedPower's evaluation report also shows the importance of customer-friendly interface design (PAC 2010). Salt River Project created a user-friendly, convenient process for their pay-as-you-go system (SRP 2009).

Large industrial organizations use energy management systems that meet the same usability requirements as the rest of their software does. This allows companies to account for energy as easily as they track spending, product quality, and other information.

As Ford and other companies expand the capabilities of on-board information systems to help drivers reduce fuel consumption, they will need to ensure these systems are not only user-friendly and safe but also provide motivation and reinforcement for improved driving practices. Auto manufacturers have systems in place for testing the usability and reliability of any new feature before mass-producing it.

Policy

Government and industry leaders can help behavioral programs grow by supporting innovation and exploration of these research areas, explaining the benefits of environmental behavior change to their colleagues, and keeping the larger goals of energy efficiency programs in mind.

Given the steep reductions in carbon dioxide emissions that governments and industries hope to accomplish, behavior change should be an addition to existing programs striving to reach higher goals, not a substitute for other efficiency measures (Kushler 2010). Since we still lack long-term information on persistence, maintaining a strong portfolio of other measures is essential.

Although we encourage decision makers at the federal and state levels to expand their support for behavioral programs and social science research, this review shows that such support should be both selective and results-focused.

By "results-focused," we mean that programs should be designed to provide measurable energy savings, whenever that is possible. Expanding behavioral program funding in the utilities sector requires quantifying and verifying the savings these programs achieve. The process for doing so is not entirely in place, although some states, such as California, have made advances (Skumatz, Khawaja & Colby 2009). The white papers published by the California Institute for Energy and Environment outline a partial blueprint for experimental design and evaluation. We recommend building on these resources. Also, we strongly support

- Quantifying the effects of media campaigns and designing these campaigns to promote measurable actions.
- Designing pilots using scientific experimental methods that address the need for control groups, random selection, and pre-test/post-test data.
- Collecting more information on the persistence of savings and how participants accomplish it.
- Designing user-friendly software, hardware, and correspondence.
- Emphasizing cause and effect throughout program design, implementation, and evaluation.
- Studying the effects of social status, gender, demographics, and public perceptions of energy efficiency.
- Reframing programs to focus on providing benefits and removing barriers (which requires understanding customers' viewpoints and knowing that information does not equal action).

Many of the practices on this list are already common in industrial product design, advertising, and marketing.

CONCLUSION

Although there has been significant progress toward establishing behavioral programs for energy efficiency, many questions remain about how these programs influence behavior and what magnitude of impact they can achieve in terms of reliable energy savings. There are also many sources of potential savings that remain unexplored. Making progress toward the following goals could expand the reach of behavioral programs, make them more effective in saving energy, and increase the likelihood that they will attract long-term and consistent funding.

Strengthening Research and Evaluation

Developing a better understanding of how specific behavioral programs cause reliable changes in behavior can help to increase the energy savings of similar programs. Utility programs have used evaluation methods that help reveal some of the factors involved in saving energy—visibility, social norms, competition, user-friendliness, and a general focus on marketing and customer benefits—but frequently do not go far enough in analyzing the effects of these factors.

In media campaigns and community-based programs, strengthening evaluation and using action recommendations could potentially allow programs to report results and set goals more concretely. In New Hampshire, Clean Air-Cool Planet has developed energy efficiency toolkits for community-based programs. Cities and towns customize the toolkits to meet local needs (CACP 2010).

Understanding participant actions, motivations, and persistence can also contribute to program success. Information on the effects of market segmentation and demographic differences is very limited, but anecdotal evidence and previous research indicates this may be influential.

Finally, there is a critical lack of information on the long-term persistence of behavioral change. It is very difficult to find evaluations of behavioral programs that have extended for more than one year. To develop confidence in behavioral programs as a reliable energy resource, it will be essential to demonstrate persistent savings. Alternatively, behavioral programs can continue to earn funding as a supportive mechanism for more traditional energy efficiency "hardware" programs. But without solid evaluation data showing reliable and persistent energy savings, it will be very difficult for utility regulators and other key decision makers to regard behavioral programs as a true energy resource. This lack of information may reduce both the growth of these programs and the application of social science to other utility-sector energy efficiency programs.

Increasing and Communicating Customer Benefits

Attention to participant benefits can make any energy efficiency program more cost-effective. As utility programs scale up their efforts, cost-effectiveness and customer buy-in become more important. One program we reviewed provided sufficient benefits to customers that the utility was able to sell the meters for close to $100 (with a satisfaction guarantee) (SRP 2010).

Program developers should be aware of potential trade-offs between cost and performance when selecting technologies. For example, although programs can reduce costs by not using advanced meters, properly designed metering and/or display devices can provide some advantages for both behavior change and program evaluation. These approaches provide an opportunity for utilities to make saving energy more visible, concrete and interactive for customers. (These are key features of behavior change programs; hence, the title of this report.)

If utilities introduce behavioral programs in ways that are designed to benefit customers—and communicate these advantages to customers clearly—that could increase public support for these programs. Since efforts to expand such programs sometimes encounter opposition due to their cost, demonstrating customer benefits is an important consideration for utilities (SGN 2010).

Effective behavior change programs take an interest in their audiences and collect data on who customers are and what they want. Market segmentation can answer some of these questions (Vine 2010).

The programs in this review that show evidence of consistent attention to audience benefits reported relatively high levels of savings and positive customer feedback (SRP 2009). Marketing-based approaches, including Community-Based Social Marketing, can address the need for customer-oriented programs, communications, and technology. Attention to Web site usability can also accomplish this goal.

The ability to see energy efficiency from the perspective of program participants underlies behavioral programs and is essential for their success. To reverse a well-known political quote: ask program participants what energy efficiency can do for them, rather than telling them what they can do for energy efficiency.

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