Applying Behavioral Strategies to Energy Decisions and Behaviors

A Summary of an
American Academy of
Arts & Sciences
Workshop

THE AMERICAN ACADEMY OF ARTS & SCIENCES

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Introduction

> We are all strongly influenced by the rules and patterns of behavior around us.
> -Karen Ehrhardt-Martinez

The production and use of energy is inherently a human enterprise. Power companies have long analyzed human energy consumption patterns to predict the quantity and timing of energy necessary to meet demand. With this information, power companies can ensure consumers receive the electricity they need, while not incurring unreasonable costs on those consumers through needless overproduction. Thus, human behavior lies at the heart of many proposed solutions to energy security and climate change. In order to continue to provide power to the people while limiting environmental harm, the human element must be better understood and incorporated into our energy strategy. Applying social and behavioral science research to energy policy-making is therefore vital for creating a more efficient and comprehensive solution to our energy needs. The first chapter of this report presents a brief history of energy policy as it connects to behavioral research and reviews recent reports in this area, including the 2011 American Academy report *Beyond Technology: Strengthening Energy Policy through Social Science*.

The remaining chapters describe the proceedings and conclusions of a workshop held on June 18–19, 2014, in White Plains, New York, to explore the application of behavioral strategies to energy decisions and behaviors. Convened by the American Academy of Arts and Sciences in partnership with the New York State Energy Research and Development Authority (NYSERDA), with co-sponsorship from the Pace Energy and Climate Center at Pace University and the SunShot program of the U.S. Department of Energy, the workshop's three primary objectives were:

1. to share the results of new research in the behavioral sciences as it had been applied to energy decision-making and clean energy programs;
2. to promote communication among social scientists, New York clean energy program managers, New York State Public Service Commission staff, and state and federal policy-makers; and
3. to improve the effectiveness of energy projects funded by the U.S. and New York State governments through the open exchange of information and experience.

The workshop participants reported key research findings and identified outstanding research questions and priorities for energy policy and programs. The goal was to bridge the conceptual and practical gap between the potential of behavioral science research and its current impact on innovation and policy-making. As Marsha L. Walton, Senior Project Manager in Energy Efficiency and Exploratory Research at NYSERDA and member of the workshop steering committee, noted at the beginning of the meeting, the workshop was intended "to bring together researchers, programs, and funders of research… to consolidate a shared vision, through partnership, between the decisions sciences and the clean energy programs."

The workshop began with a series of case studies and panel discussions, during which project leaders presented the objectives of their study and to what extent the inclusion of social science contributed to these objectives. These sessions are described in Chapters 2 and 3; Chapter 2 presents lessons learned from existing projects, whereas Chapter 3 describes emerging research that is yielding fundamental insights into human decision-making on energy efficiency and clean energy. Participants were asked to identify programs that could most directly benefit from the behavioral interventions presented at the workshop; establish how insights from the behavioral sciences could be presented to result in greatest program uptake at the state and federal levels; and determine how an approach drawing on multiple behavioral science disciplines could yield more comprehensive solutions.

The second day of the workshop examined the design of energy programs. Participants convened in breakout sessions to discuss how the lessons from the projects presented on day one could be applied to future federal and state energy programs, especially those funded by the NYSERDA Behavior Research Program and the NYSERDA Behavior Demonstrations Program (with behavioral work now being conducted under NYSERDA's Market Insights Team). Participants also explored prospective new tools for applying social science expertise to energy policy. Each of the three breakout sessions was followed by a roundtable discussion with a panel of experts to allow participants to ask questions and share conclusions raised during each breakout session. Chapter 4 summarizes these discussions and demonstrates how behavioral research could be applied immediately to the design of both existing and new programs. Additional information on the workshop agenda and participants can be found in the appendices.

Chapter 1: Applying Behavioral Strategies to Energy Decisions – A Brief History and Current Efforts

> "When push comes to shove, people use energy and people waste energy, and our actions and our decisions determine energy consumption, energy efficiency and energy savings. And it's not just people as individuals, but also people as social actors… We are all strongly influenced by the rules and patterns of behavior around us."
>
> — *Karen Ehrhardt-Martinez*

Scholars have long argued that the use of energy is directly linked to consumer decisions and behavior,[2] and that altering energy usage, such as increasing the considerations of energy efficiency during purchasing decisions, necessitates an understanding of human consumption and choices. Without this understanding, marketing efforts and clean energy program design may be ineffective in reaching their goals. Efforts to integrate social and behavioral science research into energy policy have historically focused on three questions:

1. What are the potential contributions of the social and behavioral sciences to energy policy?
2. How could related expertise best be integrated into government- and utility-run energy programs?
3. How can the impact of behavioral insights best be evaluated?

The necessity of integrating social and behavioral sciences in energy policymaking has been established by studies of household consumption and macro-social consumption processes.[3] Research studies analyzing energy usage demonstrate extreme variation in user needs and consumption,[4] highlighting the 'human' component and the necessity to consider behavior-based explanations. Similarly, the public views energy inefficiency as a problem rooted in social institutions,[5] emphasizing the importance of work discerning the relationship between individuals, the government, and energy consumption. And numerous reports from the U.S. National Research Council have demonstrated the

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[2] Cherfas, Jeremy. "Skeptics and visionaries examine energy saving." *Science* 251, no. 4990 (1991): 154-156.
[3] Lutzenhiser, Loren. "Social and behavioral aspects of energy use." *Annual Review of Energy and the Environment* 18, no. 1 (1993): 247-289.
[4] Aronson, Elliot, and Paul C. Stern. "Energy use: The human dimension." (1984).
[5] Farhar, Barbara C. "Trends in US public perceptions and preferences on energy and environmental policy." *Annual Review of Energy and the Environment* 19, no. 1 (1994): 211-239.

applicability of social science research to the energy sector, including in technology and policy acceptance[6] and behavioral issues related to energy efficiency in buildings.[7]

U.S. energy policy since the Second World War can be divided into four phases.[8] From 1945 to 1958, the nation shifted from a period of energy scarcity to energy abundance and from dependence on solid fuels to fluid fuels. From 1959 to 1968, the energy market was stabilized by business and government regulations, yet economic growth and the increased demand for petroleum challenged the ability of the U.S. to maintain sufficient petroleum reserves. As a result, between 1969 and 1980 (and especially during the oil crises in 1973 and 1979; see case study 1 below), the U.S. was forced to adjust to a limited domestic supply of petroleum and natural gas and develop policies to redistribute energy supplies and curb demand. The Federal Energy Administration was created during this time in order to implement federal allocation and pricing regulations for oil. Finally, since 1980, the U.S. Department of Energy (DOE) has assumed the role of energy regulation and monitoring to ensure the U.S. is resilient to future energy crises. Moreover, DOE is responsible for research critical for planning and providing for U.S. energy needs. For example, DOE is committed to reducing the U.S. carbon footprint in accordance with President Obama's Climate Action Plan (See Case Study 2).

Designers of national energy policy must consider the long-term needs of the country and resiliency to energy crises. DOE recently developed a 5-year strategic plan "to promote sound decision-making through understanding of energy and its interaction with the economy and the environment."[9] In addition to the numerous highly technical principles established in the strategic plan, a dedicated effort to understand the human-centric nature of energy is emerging. For example, DOE is dedicated to increasing the quantity, efficiency, and cost of electric vehicles. While numerous successes with this program have occurred in research and development, DOE has also addressed barriers to deployment of electric vehicles, such as the changing infrastructure.

[6] Stern, Paul C., and Elliot Aronson. "Energy use: The human dimension." (1984).
[7] Stern, Paul C. *Energy efficiency in buildings: Behavioral issues*. National Academies, 1985.
[8] Vietor, Richard HK. *Energy Policy in America Since 1945: A Study of Business-Government Relations*. Cambridge University Press, 1987.
[9] U.S. Department of Energy, Strategic Plan 2014 – 2018.

Case Study 1: The 1973 oil crisis

The oil crises of 1973 and 1979 were financially devastating due to massive supply disruptions triggering skyrocketing costs. America responded by creating and modifying energy efficiency management policies. During the 1973 embargo, the cost of oil increased by 70%; causing financial repercussions and increasing fear of global oil depletion due to public knowledge of vanishing reserves in Texas.[10] The oil crises generated unwanted responses by the public; and transformed and created a new economic solution. President Nixon, through the Emergency Petroleum Allocation Act, demanded technological and operational change to deal with the oil shortages and petroleum product distribution.[11] Addressing the public, he required an increase in the production of heating oil instead of gasoline, established maximum speed limits for automobiles, reduced passenger airline flights and the use of outdoor home lighting. [12] The public was asked to increase efficiency voluntarily by closing gasoline pump stations early on weekends, reducing indoor lighting, and lowering thermostat temperatures.[13] The Nixon Administration estimated that these adjustments would "result in a savings of some 315,000 barrels of heating oil a day, which is enough to heat over 1 1/2 million homes every day."[14] During the 1973 crisis, Congress also formed the Federal Energy Administration (FEA) to analyze energy data nationally, allocate supplies, regulate prices, address efficiency, and invest in unconventional energy.[15]

President Ford followed this efficiency adjustment practice by establishing the Energy Research and Development Administration (ERDA). This agency marked a shift to flexible energy policies, rather than rigid ones, so future choices could serve the best interest of the nation.[16] Another oil crisis in 1979, decreased production from 5.8 million barrels per day to 445,000 million barrels per day within a six month period, and spurred hoarding of available resources.[17] The questionable availability of oil during this time led to a transformation of the roles and responsibilities of government energy agencies and their programs. The FEA, ERDA, and several others were combined under President Carter to form the Department of Energy (DOE) to serve as one centralized organization and oversee all energy related policies and programs.[18] As the needs of the nation have

[10] "How the 1973 Oil Embargo Saved the Planet." Foreign Affairs. January 7, 2015. Accessed January 7, 2015.
[11] S. 1570, the Emergency Petroleum Allocation Act of 1973, Public Law 93-159 (87 Stat. 627).
[12] Nixon, Richard. "Address to the Nation About National Energy Policy." November 25, 1973. Online by Gerhard Peters and John T. Woolley, The American Presidency Project. http://www.presidency.ucsb.edu/ws/?pid=4051.
[13] Ibid.
[14] Ibid.
[15] Anders, Roger. "The Federal Energy Administration." Washington, D.C.: U.S. Department of Energy, November 1980. 15 pp.
[16] Buck, Alice. "A History of the Energy Research and Development Administration." Washington, DC: US
Department of Energy, March 1982. 23 pp.
[17] Verleger, Jr., Philip K. "The U.S. Petroleum Crisis of 1979." Brookings Papers on Economic Activity, 2:1979.
[18] U.S. Department of Energy, "A Brief History of the Department of Energy," http://energy.gov/management/office management/operational-management/history/brief-history-department-energy

changed, the DOE has adopted new programs, yet the focus on economic stability and investment in energy policy remains.

Case Study 2: Climate change

Global greenhouse gas emissions have been increasing in recent years, causing changes to the Earth's climate.[19] Greenhouse gas emissions and climate change have been documented and analyzed in five seminal reports by the International Panel on Climate Change (IPCC) since 1990. The fifth and most recent IPCC assessment report states that climate change will continue if greenhouse gas emissions continue to be released, resulting in altered global surface temperatures, global water cycle, ocean temperature and acidity, and will raise the level of the ocean via glacial melting.[20]

The link between energy and climate change is indisputable, and the reduction of global greenhouse gas emissions can be achieved through two interconnected processes: technological innovation[21] and behavioral interventions.[22] While there is some debate about current technological applications,[23] a seminal study outlined 15 key technological innovations that could reduce greenhouse gas emissions to mitigate future climate change. Parallel work on consumer behavior related to energy consumption has revealed numerous actions that while small on the scale of an individual, make a contribution to overall greenhouse gas emissions.[24] These parallel research industries resulted in the President's Council of Advisors on Science and Technology (PCAST) recommending that the National Science Foundation and DOE initiate a science program to support energy technologies.

[19] IPCC report
[20] IPCC report
[21] Pacala, Stephen, and Robert Socolow. "Stabilization wedges: solving the climate problem for the next 50 years with current technologies." *Science* 305, no. 5686 (2004): 968-972.
[22] Dietz, Thomas, Gerald T. Gardner, Jonathan Gilligan, Paul C. Stern, and Michael P. Vandenbergh. "Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions." *Proceedings of the National Academy of Sciences* 106, no. 44 (2009): 18452-18456.
[23] XX
[24] Gardner, Gerald T., and Paul C. Stern. "The short list: The most effective actions US households can take to curb climate change." *Environment: science and policy for sustainable development* 50, no. 5 (2008): 12-25.

Recent Efforts to Incorporate Behavior in Energy Policy

In 2010, the President's Council of Advisors on Science and Technology (PCAST) issued a report recommending changes to federal energy policy that would encourage the innovation and adoption of energy technologies.[25] This report reaffirmed that improving the framework within which energy policy is developed would increase our economic competitiveness, decrease our carbon footprint, and reduce our dependence on imported oil. In addition to numerous financial and structural recommendations, the report highlighted the necessity to "initiate a multidisciplinary social science research program to examine the U.S. energy technology innovation ecosystem." As a first step towards implementation, PCAST recommended that DOE undertake a quadrennial review, modeled on the Department of Defense Quadrennial Defense Review, to develop a national energy strategy.

Published in 2011, the first DOE Quadrennial Technology Review (QTR) offered six strategies to address national energy challenges: Deploying clean electricity, modernizing the grid, increasing building and industrial efficiency, deploying alternative hydrocarbon fuels, electrifying the vehicle fleet, and increasing vehicle efficiency. In addition to stressing technological advances that would improve energy efficiency, the QTR points to a downfall of stringently using technology by stating "…that the DOE's technology-development activities are not adequately informed by how consumers interact with the energy system or how firms decide about technologies." This observation resulted in a policy strategy: "[the] DOE will integrate an improved understanding of applied social science into its technology programs to better inform and support the department's investments." The QTR expounds this notion by stating that "the aggregated actions of individuals and organizations determine many aspects of the energy system, with demands on the system and the balance of supply and demand affected as much by individual choice, preference, and behavior, as by technical performance."

Despite increasing acceptance that the social and behavioral sciences should play a role in energy policy, there was little understanding of the best methods and practices towards successful implementation. To address this need, the American Academy of Arts and Sciences organized a two-day workshop in Washington, D.C., funded by DOE and the National Science Foundation (NSF), to explore how knowledge from the social sciences could help accelerate the adoption of cleaner and more-efficient energy technologies. The conclusions from this workshop were described in a 2011 American Academy report titled *Beyond Technology: Strengthening Energy Policy through Social Science*. Dr.

[25] President's Council of Advisors on Science and Technology, Report to the President on Accelerating the Pace of Change in Energy Technologies through an Integrated Federal Energy Policy (Washington, D.C.: Executive Office of the President, 2010), ix, http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-energy-tech-report.pdf.

Steven Koonin, then Under Secretary for Science at the DOE, stated in the preface to the report that "the social sciences are the most important to the information role, and there is good reason to believe that insights from this area would improve the prospects for success in DOE's efforts to move technologies toward commercialization."

The report was motivated by the dual goals of demonstrating the utility of social science research and promoting new social and behavioral research on underexamined questions at the intersection of energy, human behavior, and public policy. As Myron Gutmann, then the Assistant Director for Social, Behavioral, and Economic Sciences at NSF, stated to the workshop participants, "It's very much up to people like you in the research and broader scientific community to help us define the research problems and to help us make clear what are the best strategies to getting the critical answers in this area. What is clear is that every approach we take will cross traditional disciplinary boundaries."

Beyond Technology defined five strategies for strengthening energy policy through the social sciences (see sidebar). It also outlined an initial framework for a social science research agenda in each of three areas: 1) individual behavior, decision-making, and technology acceptance; 2) incorporating human factors into policy design and analysis; and 3) policy development and governance.

Five Strategies to Strengthen Energy Policy through Social Science

1. Demonstrate the value of social and behavioral research for enhancing the effectiveness of energy policy and transforming the energy system
2. Encourage the use of interdisciplinary social science research within energy programs
3. Build capacity for connecting the energy policy and social science communities
4. Incorporate social science into federal energy policy analysis
5. Engage state and local governments and regulatory communities

—from *Beyond Technology: Strengthening Energy Policy through Social Science* (American Academy of Arts and Sciences, 2011)

Building on the *Beyond Technology* report, the American Academy partnered with the New York Energy Research and Development Authority (NYSERDA) to organize a workshop in June 2014 to examine existing state- and federally-funded projects that were already implementing social science research in questions about energy. This workshop highlighted successful examples of clean energy programs that tested the impact of behavioral approaches and used experimental design to evaluate the results. To demonstrate the utility of behavioral approaches, the workshop organizers established three considerations for selecting these programs:

- Understanding Value: Policymakers need a better understanding of how social and behavioral research could bring value to their work. Furthermore, behavioral researchers need more information regarding the logistics of implementing clean energy programs in the field, as well as the values of the energy policy community, in order to focus their research on behaviors and investments that are relevant to policymakers.
- Accessing Information: Existing behavioral research is not communicated in a way that is easily understood by the energy policy community, in part because the existing literature is not written with policy applications in mind.
- Focus: There exists an extensive agenda of potential research topics and therefore it is crucial to focus on a priority set of important energy issues/programs.

The following chapters draw on existing energy research and energy programs to demonstrate the utility, effectiveness, and possibilities that exist when combining social and behavioral science research with technological innovations.

Chapter 2: Learning from Experience

Marsha L. Walton, Senior Project Manager at NYSERDA, opened the workshop, explaining that the premise of the workshop was to encourage partnerships between the decision sciences and clean energy programs. With budgets shrinking and the earth warming, the necessity to make our clean energy programs as effective as possible is critical. She emphasized that this was the central goal of the conference and of the behavior research program at NYSERDA.

Maxine Savitz, Vice-chair of the President's Council of Advisors on Science and Technology (PCAST) and the retired General Manager, Honeywell, Inc., discussed the 2010 PCAST report on accelerating the adoption of new clean energy and energy efficiency technologies.[26] A key recommendation from that report was that NSF and DOE should initiate a social science program to support technology deployment. Federal agencies have expressed interest in such a program but have struggled to develop proper evaluation criteria.

Additional opening remarks were given by former New York Congressman Richard Ottinger, Founder of the Pace Energy and Climate Center and Dean Emeritus at Pace University Law School. Ottinger addressed one of the most important issues facing the energy community: how to use knowledge from the behavioral sciences to improve communication about climate change and achieve greater energy efficiency. Although progress has been made – pollution is a punishable offense and causes of climate change are understood – the scientific and advocacy communities have had little success in persuading the public and refuting dis-information campaigns. The scientific community needs to learn how to reach the average citizen; success will come only after the public makes climate change a top priority and elects officials that support this view. Ultimately, the public cannot afford to ignore climate change. For example, extreme weather events over the last five years have cost the country billions of dollars. Advocating for reasonable solutions will help ensure action, rather than solutions that entail "freezing to death in the dark."

Karen Ehrhardt-Martinez, Principal at Human Dimensions Research, then discussed ways in which the human dimensions of energy and conservation could have a dramatic impact on energy efficiency and climate change. She reaffirmed that people don't always act the way we expect, but social scientists can help the energy community build more effective approaches. Some research has been done that can inform programs, but much of it has

[26] President's Council of Advisors on Science and Technology, *Report to the President on Accelerating the Pace of Change in Energy Technologies through an Integrated Federal Energy Policy* (Washington, D.C.: Executive Office of the President, 2010).

been done in lab settings. Therefore, NYSERDA's work testing behavioral insights and new ideas in the field will offer important findings.

Susan Mazur-Stommen, former Director, Behavior and Human Dimensions Program, American Council for an Energy Efficient Economy (ACEEE), presented the ACEEE Field Guide to Utility-Run Behavior Programs, which was the first comparative analysis of utility-run behavior programs. The study counted 281 programs offered by 104 energy providers and third parties between 2008 and 2013, and built a taxonomy around typologies, *i.e.*, key approaches/tools that are based on behavioral insights. The ACEEE Field Guide provides practitioners, evaluators, and regulators with a compilation of the different designs and strategies deployed across utility customer sectors that have incorporated behavioral approaches.

Panel 1— Designing and Evaluating Behavioral Projects

Moderator:

Marsha L. Walton, Senior Project Manager, New York State Energy Research and Development Authority

Speakers:

P. Wesley Schultz, Professor of Psychology, California State University, San Marcos; Founder and Scientific Advisor, Action Research

Jennifer Tabanico, President and Owner, Action Research

Jane S. Peters, President and Owner, Research into Action

Wesley Schultz opened the first session with three takeaway messages:

1. behavior can change;
2. behavioral science has identified a number of effective tools, such as social norms, commitment, and modeling, as well as some less effective ones;
3. more studies are needed to identify the proper conditions under which these tools should be deployed.

A number of approaches – social norms, social learning, block leaders, social comparisons, public commitments, feedback – have been demonstrated to be effective in triggering action. It is also important to recognize the choices depend on numerous other factors. For example, solar panel deployment is not random: when a household purchases solar panels, it influences others to take the same action. It also reduces the cost of

information and changes social norms. Indeed, changing social norms proves to be the one of the most powerful approaches to encourage energy-conserving behaviors, and is currently being employed by Opower.

Jennifer Tabanico then discussed community-based social marketing (CBSM) and her collaboration with NYSERDA on numerous energy pilot projects. She emphasized that the behavior matters, be it a one-time action—like installing LED light bulbs—or sustained—like altering transportation habits. Nevertheless, the type of action does necessitate different approaches to achieving effective behavioral change. Increased knowledge, favorable attitudes, and appeals to self-interest will not lead to behavioral change on their own. Rather, behavior change requires a process approach that identifies the barriers to change that are unique to an individual target. Community-based social marketing is a process that identifies the underlying mechanisms that prevent or enhance participation in specific target actions. The process includes: selecting and prioritizing target behaviors; identifying the barriers and benefits to specific target actions; developing strategies to overcome barriers and emphasize benefits; pilot testing the strategies; recording and analyzing the data; modifying if necessary; implementing broadly and continuing the evaluation. Most importantly, at each step, the process must be data driven to identify real effects from anecdotal impressions.

Jane S. Peters described experiments related to energy, behavior and the evaluative process. Evaluation is a crucial component of the process of altering energy usage. Evaluation studies reduce the time it takes to discover and scale up the most important factor(s) for a desired behavioral change. Designing, implementing, and evaluating programs is ideally done via a feedback loop between designers, evaluators, and implementers. While true experiments with randomized control trials allow the determination of causation, quasi experimentation – typically characterized by an absence of random assignment – is almost as powerful, though these studies cannot completely prove causation. The perfect experiment is often not possible in the real world. In these cases, one should focus on a design that can be implemented, with a sufficiently large sample size (and a control group) as determined by power analysis. To conclude, Jane summarized three key takeaways:

1. keep the intervention as simple and clear as possible;
2. ensure sufficient power to your sample (before you collect data); and
3. design and test for scalability (determine scalability beforehand if possible).

During the question and answer period, it was noted that the academic literature quantifies the degree to which a randomized clinical trial and quasi experiments can reveal similar effect sizes. One can therefore identify which quasi experiments are most

informative. Another participant inquired about how to measure the impact of behavioral interventions that yield small savings, and how to deal with the noise to effect ratio in such cases. There was consensus that additional metrics and a logic model can help; but regardless of the logic model, larger samples may be needed in the case of small behavioral effects.

Panel 2—Results from Clean Energy Programs that Have Used Behavioral Strategies

Moderator:

Linda Schuck, Senior Advisor, California Institute for Energy and Environment

Speakers:

Annika Todd, Senior Scientific Engineering Associate, Electricity Markets and Policy Group, Lawrence Berkeley National Laboratory

Lupe Jimenez, Demand Response R&D Program Manager, Sacramento Municipal Utility District

Briana Kane, Senior Residential Program Coordinator, Cape Light Compact

The second panel discussion was designed to learn from field experience by examining projects that have been underway for more than a year, and therefore offer initial lessons in evaluating the effectiveness of behavioral approaches. These projects were selected based on the involvement of social scientists in program design, execution, and evaluation. For example, one criterion was whether the program employed a controlled experimental design that allowed for rigorous evaluation of the impact of the behavioral intervention(s) being studied.

The panel was designed to illustrate how the integration of behavioral strategies proceeds from the original research insight through the design of pilot experiments, program implementation, data analysis, and scale-up. The presentations in this session demonstrated how particular research insights from the academic literature can be incorporated through this process. As evaluation is the ultimate key to success, this session also showed how evaluation can help refine a program once it is implemented.

Annika Todd presented examples of clean energy programs that have used behavioral strategies and rigorous evaluation from research to impact. Most programs find difficulty in progressing from academic insight to program design. A major reason is that it can be difficult for scholars to establish partnerships with utilities that may be interested in applying behavioral insights to their business model. One success story comes from Opower, which has a strong feedback mechanism for academics to incorporate new ideas and discoveries into the program.[27] Through a randomized controlled trial, Opower

[27] Nolan, Schultz, Cialdini, Griskevicius, & Goldstein (2008)

demonstrated savings after 5 years. Opower also has been particularly successful in the scaling-up phase, with 93 utility partners and a one billion dollar stock market valuation.

Lupe Jimenez discussed the Sacramento Municipal Utility District's (SMUD) Smart Pricing Options pilot program. Based on existing research and business objectives, the plan describes the two-year application of experimental rate options on a sample population of SMUD customers. The goal of the plan is to determine the electricity impacts of each of the treatments; customer characteristics associated with behavior; the roles of enabling technology in customers' daily electricity management; program impacts on customer satisfaction; rate and enabling technology program value to utilities; expected market penetration for rate and enabling technology programs; and effective educational and marketing strategies for customers. SMUD's research clearly indicated that:

- default pricing produced significant demand reductions at times of peak load;
- greater aggregate demand reduction occurred at lower costs than in the case of opt-in pricing; and
- the program presented more opportunities for customers to save money than the standard rate plan.

Finally, Briana Kane explained how the Cape Light Compact program revealed unanticipated results that necessitated a pause between the pilot and the scaling up of the project. The first phase of the pilot consisted of a grass-roots effort to increase training through FAQs, and resulted in a 9% reduction in energy use as well as increased community support for making active behavioral changes. The second phase consisted of apps and smart controls to further enable participants to engage with energy. However, phase two only produced an additional 1.9% decrease in energy use. These savings were unexpectedly lower than had been predicted, and further analysis suggested that the problem was a severe reduction in participation. Cape Light planned a third program phase that incorporated the lessons learned from phase two, with increased awareness of participation goals.

Chapter 3: Preliminary Results from New Research Programs

The afternoon panels on the first day of the workshop offered insights into emerging research at the intersection of energy policy and the decision sciences. The afternoon included a presentation by Thomas Dietz on the current state and future direction of social science research on energy, with a particular focus on the tension between use-based research and research aimed at developing fundamental insights into human behavior (Figure 1).

While focusing on practical applications is appealing to funders, they should also encourage and support young scientists who seek to contribute to fundamental understanding, because there is no doubt that fundamental understanding leads to potential real-world applications of knowledge. Thus, while "Edison's Quadrant" (practical application) or "Bohr's Quadrant" (fundamental research) may be appealing to many, it is important to support research in "Pasteur's Quadrant" (*use-inspired* fundamental research) in order to ensure the future vibrancy of this field – that is, to maintain a simultaneous focus on both fundamental understanding and practical application.

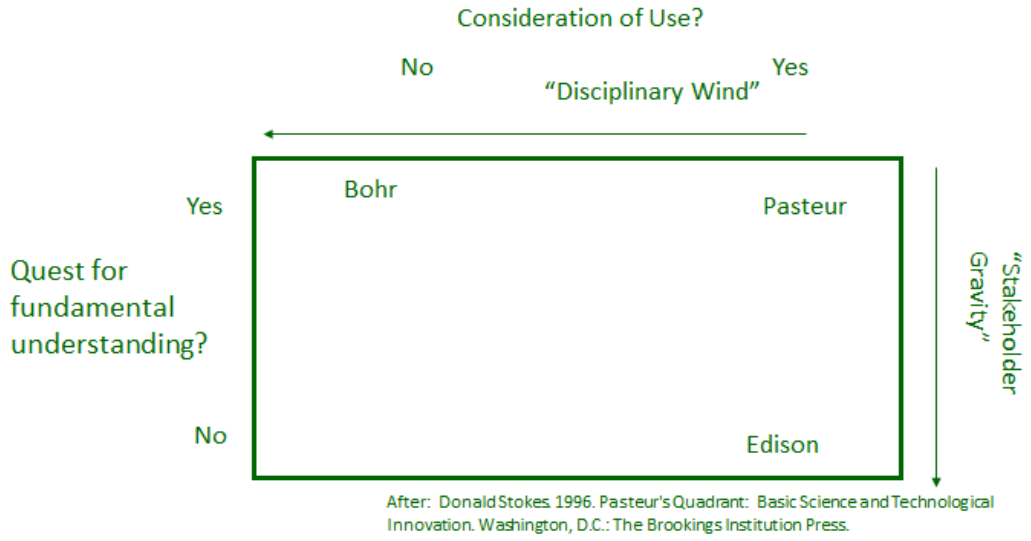

Figure 1. More attention to Pasteur's quadrant could help move society toward a better future.

The sections that follow summarize two panel discussions during which participants learned about eight projects that are advancing both fundamental understanding of human behavior and important insights into program design.

Panel 3—Preliminary Results from New Research Programs: Part 1

Moderator:

Paul Stern, Senior Scholar, U.S. National Research Council/National Academy of Sciences

Speakers:

Marcos Pelenur, Head of Energy & Sustainability, UK Behavioural Insights Team: *Applying behavioural insights to energy use in the UK: lessons from the field*

Sébastien Houde, Assistant Professor of Economics, University of Maryland: *Information, framing and the adoption of energy-intensive durables*

Easan Drury, Senior Engineer, Strategic Energy Analysis Center, National Renewable Energy Laboratory: *Running randomized controlled experiments to better understand household-level motivations for adopting rooftop solar panels*

Varun Rai, Assistant Professor of Public Affairs, University of Texas at Austin: *Connecting the dots between theory, simulation, and experiments*

Marcos Pelenur described three projects from the Behavioural Insights Team based in the United Kingdom: two field experiments – a domestic heating control and energy efficient appliance pilot – and a policy intervention aimed at improving the clarity and saliency of energy performance certificates. The heating control experiment compared the effectiveness of providing information with the effectiveness of using a trusted messenger – in this case, the boiler inspector – to instruct homeowners on how to program their thermostats. The energy efficient appliance pilot studied the effectiveness of presenting energy savings in lifetime costs rather than annual kilowatt hours. Both experiments highlighted the complexities of running field trials involving local authorities, the central government, and service providers, as well as the benefits of providing energy savings information in terms of financial savings rather than energy use.

Sébastien Houde presented a study that examined the purchase of energy intensive durable goods through an online marketplace. Online information sources and marketplaces are essential to investigate since customers often formulate buying decisions through online research. Therefore, the content of online information is an important influence in the adoption of energy efficient products. Although online appliance sales only represent 5-10% of all durable goods sales, many store-based sales are influenced by online information and interactions (38% of all sales). Yet few guidelines exist regarding how energy information should be presented and regulated in online marketplaces. From an experimental standpoint, online retail has the benefit of being easily manipulated – choice architecture changes are straightforward and contained. It is also easy to collect data via clicks and other patterns of behavior.

Houde then described an appliance calculator, The Stanford/ARPA-E Appliance Calculator, which creates search results based on input parameters. Using prospective

refrigerator purchasers as the target audience, the researchers tested a number of recruitment messages. The most effective recruiting phrase was "Stop wasting money." A refrigerator's efficiency ranking was an important contributor to the final purchasing decision, but specific information about energy efficiency was not.

Eason Drury then presented a series of randomized controlled experiments that investigated homeowner motivations for adopting rooftop solar panels. The central question is what messaging would make these technologies attractive in a non-incentivized future? Currently, surveys show that far fewer than 10% of people who are seriously considering solar power actually adopt it. Market-based pilot programs are testing the impact of three approaches on solar interest and adoption:

1. using online friendship networks and local information to boost interest in solar;
2. winning back lost leads through different messaging frames; and
3. working with solar installers to increase referrals.

Drury also described field experiments on thermostat settings, energy performance certificates, and energy labels. The biggest lesson was not to underestimate the difficulty of on the ground implementation trials—pilots and follow-ups are essential. Complexities included gaining approval and support from local authorities, central government, and local energy personnel.

Varun Rai discussed the connection between theory, simulation, and experiments. He described experiments that used local data to examine the question of "what do individual behaviors mean for a whole population?" His research team used data collected from individual households to:

- investigate roles of motivational drivers, social norms, and goal-setting in learning about and adopting energy efficiency measures and solar PV;
- understand how delivering information through online games (gamification) could address the non-monetary barriers to technology adoption; and
- determine whether the method of delivery (survey vs. gamification) affected the experimental outcome.

Simulations may provide a new platform to test information campaigns, reducing the cost of pilot programs. An essential question is how to determine the most effective locus for an intervention; highly-connected people are particularly desired. For example, in a simulation of solar PV adoption, providing additional information to 500 such "nodal" individuals led to a 10% increase in the adoption rate in the target population.

Panel 4—Preliminary Results from New Research Programs: Part 2

Moderator:

Thomas Dietz, Professor of Sociology and Environmental Science and Policy, Michigan State University

Speakers:

Constantine Kontokosta, Deputy Director, Center for Urban Science and Progress (CUSP), New York University: *Modeling, predicting, and influencing energy behavior in commercial tenants and homeowners: an overview of two current research initiatives*

Edy Moulton, Research Coordinator, Columbia University: *Building better infrastructure through choice architecture: A SUSSTAIN collaboration.*

Inês Azevedo, Associate Professor, Engineering and Public Policy and Co-Director, Center for Climate and Energy Decision-Making (CEDM), Carnegie Mellon University: *Assessing the effect of an efficiency appliance rebate program on energy consumption*

James Kimmel, Behavioral Scientist, ideas42: *Does giving comparative fuel cost information to potential car buyers affect purchasing behavior?*

Constantine Kontokosta described research underway at the new Center for Urban Science and Progress (CUSP) at New York University. CUSP focuses on taking new tools and applying them to quality of life in cities. It is a unique public-private research center that uses New York City as its laboratory and classroom projects to help cities around the world become more productive, livable, equitable, and resilient. CUSP observes, analyzes, and models cities to optimize outcomes, prototype new solutions, formalize new tools and processes, and develop new expertise/experts. Prof. Kontokosta described his research using building energy data emerging from energy disclosure policies across multiple cities. The goals of his team's research are to:

- Understand and model patterns and flow of energy use and carbon emissions within and across cities, across spatial and temporal scales
- Study the relationship between the urban built environment, urban development, and resource efficiency, particularly focusing on issues of socioeconomic and demographic disparities
- Provide policymakers, community organizations, and the real estate community with actionable insight to support strategies to reduce resource consumption and carbon emission in cities

His team currently possesses one of the largest databases of heterogeneous, non-self-selected building energy, water, and building attribute data available outside of the U.S. Department of Energy. Prof. Kontokosta presented his city energy analytics work with New York City's Local Law 84, as well as projects underway to develop a TenantStar tenant energy performance model and to understand the determinants of the energy

retrofit decision using data from NYSERDA on more than 60,000 energy audits and 30,000 energy projects across New York State.

Edy Moulton presented the SUSSTAIN collaboration, a research coordination network funded by NSF. SUSSTAIN uses choice architecture tools – including default manipulation and gain/loss framing – to modify an industry standard sustainability rating system called Envision, recently released by the Institute for Sustainable Infrastructure (ISI). The modified version of Envision system led to significantly different Envision (sustainability) scores in infrastructure designs created by the pilot groups. SUSSTAIN advocates that building interventions that target individuals upstream – that affect the people who make high level decisions and design systems and products, not just end users – will lead to a larger change.

Inês Azevedo highlighted the paucity of systematic evaluation of actual energy savings in programs such as appliance rebate programs. She presented an analysis of 30,000 randomly selected households that participated in such programs from 2008 to 2011. A notable finding was that there was a small increase in electricity consumption after applying for an appliance rebate, while other government efficiency programs that targeted the same consumers led to a decrease in energy use. Because the program didn't require that consumers turn in their old appliances, it is possible that the program simply encouraged them to purchase additional appliances, rather than actually replacing inefficient models with more-efficient ones.

Jamie Kimmel presented work from ideas42 on how the presentation of short-term and long-term fuel cost information affects vehicle-purchasing behavior. ideas42 conducted experiments at numerous dealerships across the USA, equipping research assistants with iPads that gave potential customers comparative information on the fuel costs of vehicles that they were considering. Robust results from the experiment are still pending, however there are early positive indicators that this information had a positive effect on the average MPG of purchased vehicles. Of public policy note, this study demonstrates the often ineffective nature of standard fuel economy stickers on cars. Most individuals arrive at a dealership already knowing which vehicle they want to purchase, and these labels are ineffective at influencing the decision-making process because the fuel cost information is coming too late. It may therefore be more effective to provide fuel efficiency information earlier in the purchasing process.

Chapter 4: Informing the Design of Energy Programs

Anne Dougherty, Advisor and Co-Owner of Illume Advising, LLC, opened the second day of the workshop with a presentation overviewing why behavioral strategies should be included in clean energy programs, and implementation strategies for program designers. Illume Advising consultants connect academic insights to practical applications in industry. Many of the behavior change theories that program designers and practitioners rely on today were developed prior to massive shifts in communication and social engagement. Research is underway to update these theories, but application to real-world programs remains lacking. Dougherty emphasized that both structure and process must be a fundamental focus of both researchers and practitioners. The goal should be to build a pipeline to sustain research on energy and behavior and to create opportunities for young researchers.

The remainder of the second day was devoted to three small-group discussions, wherein the participants gathered in groups of 7-8 people to discuss specific focus questions. Following each of these small group discussions, the participants reconvened in plenary session to report on their group's key conclusions. An expert panel of respondents then provided feedback on the conclusions and led a general discussion of key takeaway points.

Breakout Session 1—Identifying and Understanding Barriers to Applying Behavioral Strategies to Existing Utility Programs

Moderator:

Alexandra Dunn, *Senior Project Analyst, Research into Action*

Discussion questions:

1. Identifying and understanding barriers:
    - What are the structural/financial/regulatory barriers?
    - What are programmatic barriers to running pilot approaches that may be unproven?
2. What are some potential solutions to these barriers?

Respondents:

Anne Dougherty, *Illume Advising, LLC*

Michael Goldman, *Senior Research Analyst, Energy Efficiency, Northeast Utilities*

P. Wesley Schultz, *California State University, San Marcos; Action Research*

Edward Vine, *Staff Scientist (Rehired Retiree), Lawrence Berkeley National Laboratory; Manager, Environmental Program at the California Institute for Energy and Environment*

The goal of Breakout Session 1 was to identify structural, financial, regulatory, and programmatic barriers to implementation, and propose solutions to these barriers. Participants discussed the risk, policy and data management of studies that were currently underway. In addition, utility companies need to claim savings due to behavioral programs, therefore sound evaluation methodologies must be used to evaluate the impacts of behavioral pilots and programs.

Challenges identified in this breakout session included:

- reducing and/or removing perceptions of risk in behavioral programs;
- highlighting that multiple methods are necessary to respond to energy needs;
- understanding that over time decision-makers will be more comfortable funding these programs;
- quantifying behavioral impacts to facilitate comparison of behavior-based strategies with technology-based improvements;
- removing the artificial dichotomy between efficiency and conservation;
- using randomized controlled trials to provide quality data for analysis;
- considering the regulatory barriers prior to implementation; and
- deliberating among stakeholders to ensure consensus on claimed impacts.

Solutions presented to these challenges included:

- establishing a consensus among program managers that the success of energy programs relies on understanding behavior;
- integrate behavioral approaches throughout a utility company rather than just in the research department;
- rebrand and broaden the definition of behavior;
- use market segmentation as a tool to understand acceptance of new measures;
- attract young researchers who are more likely to embrace novel thinking;
- develop a professional community to share common strategies and problems;
- establish funding sources to support behavioral studies; and
- test behavioral approaches in large trials that yield large efficiency opportunities.

Participants identified two essential conclusions from this exercise. First, that there is a growing amount of work being done in the U.S. and around the world to increase our knowledge of the interaction of behavior and energy use. Second, that workshops bringing together individuals representing a variety of disciplines, such as this workshop or the annual BECC conference, are essential to continue to advance the field.

Breakout Session 2—Identifying Research Gaps and Next Steps

Moderator:

Maxine L. Savitz, *National Academy of Engineering; Honeywell, Inc., retired*

Discussion questions:

1. Prioritizing programs for behavioral interventions:
   - Where is the greatest need for new field experiments?
   - What information do we need to establish a longer-term research agenda?
2. Where are the most promising opportunities for future collaboration among researchers, government programs, and the private sector?
3. How could the lessons from this workshop be transmitted broadly to scholars, program managers, and policymakers?

Respondents:

Elaine Ulrich, *Acting Soft Costs Program Manager, SunShot Initiative, U.S. Department of Energy*

Garry Brown, *Commissioner, New York State Public Service Commission*

Adam Diamant, *Technical Executive, Energy and Environmental Analysis Program, Electric Power Research Institute*

Elke Weber, *Jerome A. Chazen Professor of International Business, Columbia Business School; Professor of Psychology and Earth Institute Professor, Columbia University*

This breakout session revealed the importance of having access to data through standard reporting and access systems. Moreover, there is a need for more sophisticated "big data" analyses to inform program design. Longitudinal studies will be essential to plan for future utility needs. Variables that should be included in longitudinal studies should include structural differences among programs, and the habits and behaviors of owners, occupants, suppliers, retrofit contractors, and salespeople. Closing the efficiency gaps in existing programs by adding behavioral interventions and emerging grid technologies will all be part of the future of energy efficiency.

The discussion began with participants recognizing the lack of long-range data on behavioral trends, including the persistence of behavioral changes and energy decisions that would allow utilities to predict the impact of energy efficiency programs energy use five or more years down the road. Utilities cannot rely on hope or conjecture, but would profit from theory and data-based analyses and projections. Researchers also have data needs, including on past consumption patterns, demographic information of utility customers, and the effects of past or current programs and interventions. They need concrete data and analysis, yet it can be difficult for researchers to acquire utility data and

form working relationships with industry personnel. PUCs are well-positioned to encourage both rigorous longitudinal studies on energy behavior and also the sharing of data between researchers and utilities.

Participants also questioned the idea that utilities are monolithic; it is important to understand the variation in their structures and incentives. Utility planners plan twenty years out or more, and are slowly, through quality data, becoming comfortable with behavioral strategies. While there is interest in behavioral approaches in the world of investor-owned utilities, the industry is heavily regulated and therefore difficult to change. Action requires the utility commissioners to share this interest. This reveals the necessity to consider the most conducive locations to do field experiments, but also the need to work with and educate PUCs on the importance and contributions of behavioral strategies.

The future of collaboration must be focused on the process: there should be better mechanisms for energy efficiency program designers and managers to communicate their needs to researchers. In addition, strategic planning must create opportunities for consideration of behavioral approaches. Another possibility for collaboration is through research networks, where different groups would collaborate on proposals to be funded by multiple sources. These could include special interest groups that make compelling cases to regulators and use the power of public utility commissions. Moreover, energy efficiency programs must set goals that are realistically achievable and measurable through assessment and evaluation. A key positive initial step would be a comprehensive review and meta-analysis of past efforts that will also serve to identify knowledge gaps and point the way to possible future program solutions.

Key conclusions from this session include the need to transmit lessons learned broadly to scholars, program managers, and policymakers and to publish or make otherwise available analyses of data from previous utility programs. Additionally, ensuring industry personnel and policymakers within the energy world are equipped with knowledge of proper experimental design, such as randomized control trials, would ensure quality social science research outcomes. Furthermore, case studies and meta-analyses must be performed to establish current insights and highlight and outline the next frontier of energy-related behavioral research. Finally, participants emphasized that the effective use of social media has the potential to ensure the widest spread of knowledge.

Breakout Session 3—Integrating Behavior Strategies in NYSERDA Programs

Moderator:

Marsha L. Walton, *NYSERDA*

Respondents:

Jennifer Tabanico, *President and Owner, Action Research*

P. Wesley Schultz, *California State University, San Marcos; Scientific Advisor, Action Research*

Jessica Nolan, *Scientific Advisor, Action Research; Associate Professor of Psychology, University of Scranton*

During the third breakout session, participants discussed preliminary recommendations developed by consultants in advance of the workshop, for applying behavior strategies to three NYSERDA programs: the Existing Facilities Program (EFP), the Multifamily Performance Program (MPP), and EmPower, a program to reduce energy consumption (and therefore costs) among low-income households. Detailed overviews of each program and preliminary design recommendations are included in Appendix A.

The Existing Facilities Program

The focus of the EFP is on building long-term relationships between EFP staff and building owners over multiple years, and to continually improve building efficiency through additional upgrades over the same period. The goal is to use performance-based incentives to increase energy efficiency in existing buildings in New York State, including existing commercial and large institutional buildings, schools, hospitals, etc.

The consultants' analysis indicated that the greatest opportunity to improve the effectiveness of this program was to increase the savings of the buildings already in the program. One approach would be to develop energy efficiency "packages" under the behavioral theory that, although "choice overload" is not as much of a barrier as once thought, there are still benefits to presenting consumers with simple decisions. It is also important to set understandable, attainable, quantitative goals up front and to make these goals an integral part of the master plan for a particular building. There is an opportunity to use vendors as a target audience, perhaps through a "Supplier Star" recognition program, and to better capitalize on communities of practice and the potential of social networks.

The Multifamily Performance Program

The Multifamily Performance Program (MPP) provides New York's multifamily building managers, owners, and other decision-makers with technical expertise, technology recommendations, and financial incentives to improve building energy performance for participating customers. The program provides financial incentives and administrative support and partners to work with the building owners. The goal is to achieve 15% energy savings through retrofits of multifamily buildings, although often owners will express interest in or commit to even higher energy savings. To cultivate demand among potential tenants, one recommended practice is to use building labeling to specify buildings that have achieved a high level of efficiency and those that have not. It is important to work in geographically defined areas in order to facilitate comparative evaluations.

EmPower

The EmPower program aims to improve energy efficiency, reduce energy consumption, and lower energy costs among low-income households. Empower provides qualifying households with cost-effective efficiency measures and education at no cost. The program provides energy audits to low income households and provides qualifying participants with free measures, including high-efficiency light bulbs, energy-efficient refrigerators and freezers, new insulation, ducts and sealing, and efficient heating systems.

The preliminary recommendations for EmPower focused on increasing participation in the program. One suggested strategy was to personalize the recruitment message through a social diffusion approach, i.e. harnessing trusted people to spread the word. Existing participants could act as ambassadors, particularly through social media. A complementary approach would be to work with the school system to raise awareness of energy efficiency and the EmPower program among children. The workshop participants suggested that the program could coach people on behavioral changes that would reduce energy use – possibly through the use of "behavior contracts."

One challenge was the perceived stigma associated with participation in the program. A simple change in language from "free" to "no cost" may ameliorate this concern, as would emphasizing that the program is already paid for through a surcharge on customer utility bills. Another challenge is the need to collect more information on participants and potential participants; for example what percentage are occupant landlords, absentee landlords, resident owners, or renters.

Appendix A: NYSERDA Program Recommendations

Multifamily Performance Program (MPP)

Program Description

The Multifamily Performance Program (MPP) provides the State of New York's building managers, owners, and other decision-makers with technical expertise, technology recommendations, and financial incentives to improve participating customers' buildings' energy performance. MPP's audience is multifamily units with five or more units and four or more floors. MPP has a network of building energy performance professionals, called "partners," who lead building decision-makers through the process of assessing, identifying, and evaluating energy-efficient measures, securing financing, specifying equipment upgrades, and overseeing project implementation activities. The building owner enters into a contractual arrangement with the MPP partner and is eligible to receive a financial incentive after the work is complete. The incentive is released in two or three payments.

MPP's role is to facilitate the partner/building relationship, provide financial incentives, market MPP, and provide quality control. MPP supports its partners through monthly telephone conference calls, orientations, statewide meetings, and a variety of online resources including an online forum for questions and answers. MPP staff and its partners conduct meetings where potential building energy upgrades and incentives are discussed with building owners. The meetings are used to ensure the project is a good fit for the MPP program, as well as create project goals and a project plan with participants.

Target Goals

- **Increase amount of energy saved by MPP projects, through increasing program intake; and/or**
- **Increase amount of energy saved by MPP projects by increasing total energy savings per project.**

Preliminary Behavioral Recommendations

Increase publicity of NY Energy Smart plaque/building energy usage to build a social norm. Successfully completed MPP buildings that achieve a predetermined level of efficiency can receive a plaque to acknowledge their energy-efficiency performance. However, most projects that receive a plaque do not publicly display it. This could be because building owners' are not familiar with the label or ascribe a value to it. The plaque offers an excellent opportunity to build MPP brand awareness and create an added non-monetary incentive for building owners to participate in the program. There are many ways of labeling/publicizing achieved energy savings, such as by encouraging building owner to mount the plaque on the outside of the building, incorporating images and messages into electronic and media communications to build brand recognition, and publicizing the benefits of leasing space from buildings that have achieved the NY Energy Smart status. For example, MPP could re-design the

plaque to focus on rewarding buildings that achieve a higher level of efficiency savings (e.g., 25%), reframing it not as just a reward for completing the program, but for achieving above and beyond, which may make buildings more likely to display it.

This approach might also involve partnerships with groups including apartment-finder websites, local trade magazines, or other venues that building owners and tenants frequent. For example, local trade magazines could publish the names of buildings that have completed the MPP program and/or testimonials from building owners about the benefits of MPP participation. NY trade magazines could also feature stories drawing attention to any particularly important or large projects in communities throughout New York State.

Train MPP partners in persuasive language skills to help overcome building owners' barriers. Effective partners are seen as essential to increasing recruitment, as three fourths of leads come from partners. Training could be provided for MPP partners to assist them in finding, targeting, and persuading building owners to participate in MPP. These trainings would build partners' self-efficacy for influencing leads to complete the MPP process. Trainings should include persuasive strategies such as foot-in-the-door techniques (getting clients to agree to a small request to lead up to a larger request), disrupt and reframe techniques (where a minor verbal anomaly, such as stating savings as the number of days the equipment upgrades would continue to provide savings after first costs have been paid off), and communicating more vividly to make the message more compelling.

Six barriers to initial participation have already been identified by research: perceived costs, lack of tenant demand, perceived low value in efficiency investments, capacity to find a partner, time and resources to complete a project, and partner motivations to recruit participants. The training would provide partners with the tools and techniques for communicating with building owners about how specific barriers to energy efficiency projects can be overcome. For example, communication is more effective when localized. Therefore, training should provide strategies for overcoming barriers and emphasizing benefits that are locally relevant. Examples include how to locally market an energy-efficient building or showing potential savings with a local example cost sheet.

Increase comprehensiveness of MPP's Energy Reduction Plans through goal setting, normative framing and commitment. Partners convene meetings with building owners considering participating in MPP to discuss potential energy-efficient upgrades, set project goals and define project work scopes in their energy reduction plans. These meetings/communications represent an important touch point for getting MPP customers to set high-efficiency goals. Partners could convene a meeting to discuss the draft energy reduction plans and a short agreement form could be provided to building owners to sign agreeing to energy savings goals. Research on commitment suggests that once a person signs their name to something, they are more likely to go through with the commitment.

The application form could also include normative information—i.e., X% of MPP buildings in NY achieve 18% savings, X% of MPP buildings this year achieved 20% savings, or (name of a well-known building) achieved 22% savings. From there, it could ask the client to commit to

achieving at least that amount of savings. This information could be drawn from MPP reports and could be developed using local information to customize the normative information provided.

Later in the project timeline, once a work scope has been drawn up and an in-depth building assessment completed to identify the most cost-effective energy upgrades, normative information could be used again to influence more comprehensive projects and achieve the original project goals.

EmPower New York

Program Description

EmPower New York (EmPower) aims to improve energy efficiency, reduce energy consumption, and lower energy costs among low-income households. EmPower provides qualifying households with cost-effective efficiency measures and education at no cost. Specifically, EmPower provides services to low income customers with incomes below 60% of the state median income and to utility customers enrolled in a utility low-income payment program. The program targets both single-family homes and multifamily buildings with fewer than 100 units.

Participants receive upgrades such as high-efficiency light bulbs, energy-efficient refrigerators and freezers, new insulation, ducts and sealing, and efficient heating systems. Customers who do not receive any in-home services receive an educational packet, three compact fluorescent lamps, a water temperature thermometer, a nightlight, and an invitation to attend an energy and financial management workshop. Households also receive an energy audit and in-home education on additional energy saving strategies if they would benefit from these services.

To participate, residents or building owners first must submit an application. Participants are referred to the program through utilities and other NYSERDA approved agencies, including community-based organizations, weatherization assistance programs, etc. Referrals may also come from contractors or a customer may request an application directly. Approved applicant households or buildings are notified and provided with contact information for a Building Professional Institute (BPI)-certified contractor who will provide the EmPower services. The BPI contractor works directly with the resident or building owner. Once the work is completed, the contractor invoices EmPower and receives payment for the installed equipment and services rendered. All work is subject to inspection by an independent contractor for quality control.

Program evaluations report that the participating households achieve reductions in electricity and gas. An analysis of the 2010-2011 data showed that across all participants in the program, the evaluated gross savings was 16,623 MWh of electricity in the year following the program. For gas, the evaluated gross savings was 32,104 MMBtu for that same time period. The realization rates were 97% and 49% for the electric and gas respectively[28]. An earlier 2007-2008 evaluation showed that the evaluated gross savings of the EmPower program was 11,295,798 kWh and 64,095 MMBtu annually. In that evaluation, the realization rates were 54% and 70% for the electric and gas, respectively. The majority of these savings are attributed to refrigerator replacement (50%) and to lighting upgrades (37%). Evaluation data show that most of the participants own their properties (78%), and only 22% are renters.

[28] A realization rate is defined as the ratio of measured savings to audit-predicted savings. The realization rate is typically expressed as a percentage. If the predicted and measured savings are the same, then the realization rate would be equal to 100%. If measured savings exceed predicted savings, the realization rate is greater than 100%. When measured savings are less than predicted savings, the realization rate is less than 100%.

Target Goals

The target goals identified for the EmPower program as part of this exercise were:

1. **Increase the number of program participants, and in particular participants who are renters; and**
2. **Increase the energy savings for participating households.**

Preliminary Behavioral Recommendations

From a behavioral perspective, the EmPower program contains a number of very strong elements. The program has removed the cost barrier for low-income residents, the application process is relatively straightforward, contractors are compensated for their work, and the results show that participating households reduce energy usage. Thus, it is from a strong foundation that we extend some recommendations for improvement.

1. **Create more personalized and direct communication.** While the EmPower program reaches a large number of New York residents, there is still some room for improvement. The current recruitment strategy has used traditional channels of marketing along with support from community-based organizations and weatherization assistance programs to distribute information about the program in the service areas of participating utilities. Currently, the cost per customer acquisition is unknown, and the link between marketing and outreach and referrals has not been clearly established. In an effort to further bolster participation, EmPower reaches out extensively through a number of programs that serve the low income audience including community groups, community-based organizations, and weatherization assistance programs. Supplementing the existing approaches with more direct and personalized forms of communication might help to increase the participation rate. For example, EmPower could continue to work effectively with community programs to distribute the EmPower brochure and inform the people they work with about the EmPower program opportunities. However, this could be supplemented with materials that are tailored to the specific needs of the target communities and that leverage the identity and values of the community and partnering organizations. This would allow EmPower to more fully leverage the credibility of organizations that already have close affiliations in the target communities. In addition, the partnering organizations would benefit from providing their audience another valuable service.

Session participants offered the following specific suggestions to personalize outreach to the target audience and harness the power of social diffusion:

a. **Use current participants as ambassadors for the program**. This approach is already used in EmPower marketing materials, and it solicits testimonials from current participants and uses them in the marketing materials. Another approach might be to conduct program satisfaction surveys and ask those participants who are highly satisfied to "refer a friend."

b. **Recruit participants via schools located in income-eligible areas.** Another approach would be to contact the families of students who participate in the reduced or free lunch program. Another approach might be to use a community goal and provide schools with money based on the number of parents who sign-up. Parents could be encouraged to sign-up their neighbors as well.

c. Disseminate information via church and other community leaders.

d. **Expand the use of social media** (e.g., facebook so that current participants can "like" and "share" information about the EmPower program with friends.

2. **Develop a better understanding of the renter audience.** While EmPower separately targets owners and renters in their outreach, most of the EmPower participants are homeowners. This suggests that there is an opportunity to expand the number of renters in the program, especially given the focus on low-income households that often do not own their homes. A large barrier that was identified by EmPower staff was that because renters are typically temporary residents at the address, they often don't own their stoves and refrigerators. Renters may not be interested in upgrading their landlords' properties, even though renters who pay for their own utilities would benefit from reduced utility bills. Another barrier that was identified by EmPower staff is that many renters could be reluctant to initiate program activities without consent from their landlords. Some additional background survey work, such as focus groups and interviews with renters, would help to identify the true barriers and benefits associated with EmPower Program participation and provide a foundation for recruitment and marketing materials that resonate more strongly with renters. Revising its marketing materials to address the true barriers and benefits of the EmPower Program could capture a greater share of the potentially large renter population.

Session participants also pointed out that:

a. In addition to distinguishing between owners and renters, an attempt should be made to understand the demographics of renters. For example, elderly renters may need to be approached differently than renters with children.

b. Work needs to be done to understand how best to navigate the relationship between owners and renters. For example, how might renters be better supported in their communications with landlords?

3. **Continue to expand use of behavioral techniques as part of in-home education.** The evaluations conducted to date have established that the educational materials provided lead to positive spillover effects. In this context, spillover effects refer to participants who

installed energy-efficiency measures beyond the EmPower program upgrades. The 80% of participants who reported that they had increased their energy-efficiency knowledge from the program had a correspondingly higher spillover rate. As a result, we see an opportunity to enhance the educational component of EmPower, and to introduce additional strategies to commit participating households to specific energy-saving actions. EmPower currently uses a comprehensive in-home education guide to which incorporates a number of behavioral principles such as commitments and use of personalized information. These elements are strong and could be further enhanced. For example, EmPower could distribute magnetic prompts for households to put on their refrigerators that include some of the recommended actions promoted in the educational materials/workshops to help overcome the common barrier of forgetfulness. Moreover, the program could enhance the current Energy Savings Action Plan to strengthen the commitments made by participants. For example, the Action Plan could incorporate goal setting by having participants state specific completion dates for each action and jot down notes for how, when, and where they will do each action. This method encourages the participant to begin to engage in some of the cognitive work of completing the actions. The Energy Savings Action Plan could also be leveraged so that not only do household residents retain a copy of their own commitment as a reminder, but that the commitments are made public through a website, newspaper, social media, community board, or other appropriate format (upon permission). Not only are public commitments more effective than private commitments, but this would also allow the program to begin to group commitment (which could establish a social norm). These commitments could also be another metric EmPower could report.

[The group did not have time to critique the third recommendation]

Challenges identified for recruiting residents into the program:

- Target audience is concerned with status and does not want to be seen as "poor."
- Absentee landlords do not maintain property and are unresponsive to tenant needs in general.

Other suggestions for messages from participants:

- Use existing data to generate reports of how much energy/money can be saved. Use loss-framing to make this information more salient and motivating to potential new recruits.
- Consider choice of words very carefully- it may be better to say "no cost" instead of "free" given the status concerns mentioned earlier.
- Remind participants that they have already paid for the program via the SBC surcharge on their utility bills.

Existing Facilities Program (EFP)

Program Description

The overarching goal of the Existing Facilities Program (EFP) is to increase energy-efficiency in existing commercial and institutional buildings in the state of New York. EFP provides a variety of incentives to offset the cost of energy-efficiency upgrades. The amount of the incentive is based on EFP projects' verifiable annual energy savings. EFP also provides resources to obtain the technical expertise needed to complete projects, such as directing participants to other NYSERDA programs that perform feasibility studies. The focus of the EFP is on building long-term relationships between EFP staff and building owners (over multiple years), and to continually improve building efficiency through additional upgrades over a period of multiple years. For example, the first year a building may upgrade their lighting systems, the next year they may install a more efficient HVAC system, and so on.

EFP's project incentives are distributed in two ways. For "performance-based" projects, the amount of the incentive is based on EFP projects' verifiable annual energy savings. EFP also has "pre-qualified" measures for small businesses to cover specific, pre-approved products or equipment on a dollars-per-unit basis, but these projects are a much smaller share of EFP's customer base.

The majority of NYSERDA's EFP projects focus on lighting improvements (57%), controls and variable frequency drives (VFDs) (21%), and cooling measures (16%). Most EFP participants fall into one of the following categories: institutions (university, hospital, etc.); offices; and large retail stores. Eligible measures include both electric and natural gas upgrades, and include lightning, motors, VFDs, energy management systems, heating ventilation and air cooling (HVAC), demand response, controls, furnaces/boilers, water heaters, steam/hot water distribution piping insulation, and heat recovery. A recent EFP evaluation found that the top concerns among potential EFP participants included access to funding, limited capital budgets and time, and uncertainty or confusion about savings associated with equipment upgrades.

Target Goals

- **Increase EFP participants' energy savings, or**
- **Increase EFP participants' energy saving goals.**

Preliminary Behavioral Recommendations

1. **Create packages of energy efficiency products and services to reduce choice overload.** NYSERDA's EFP offers a large number of incentives for a wide variety of measures that participants can choose to install. However, the large number of options may lead to **choice overload**. As a result of choice overload, participants may go with the easiest, simplest, or already understood options (such as lighting), rather than engaging with a system wide retrofit that would lead to greater savings. It could be more effective to create a smaller subset of pre-selected "packages" of energy-efficiency measures and show how the pre-selected measures build upon each other to optimize a buildings'

energy performance. The packages could be graphically represented in a series of visual guides or case studies of successful EFP projects.

2. **Ask potential EFP participants to set specific energy-efficiency goals upfront.** NYSERDA's EFP focuses on building long-term relationships with EFP participants, and therefore the program has emphasized participatory conversations between staff and participants about their goals, needs, etc. While this high-engagement approach has several advantages, one recommendation is that these conversations include **a more quantitative focus** and include setting a specific energy- savings goal from the start, such as a percent energy savings per square foot. By leveraging the previous successes of the program in case studies, EFP could convey information about the higher end of savings that could be achieved and then ask new participants to set a comparable goal for their retrofit. Using information on previous successes could work to "**anchor**" the participant to a higher goal than they would have otherwise set. Moreover, ensuring everyone sets a goal upfront could help drive each participant to achieve more savings to meet their personal commitment.

3. **Create a statewide New York Governor's Energy Challenge to spur EFP participation.** EFP already works with programs such as the Mayor's Carbon Challenge in New York City, where commercial buildings pledge to make improvements to reduce their carbon impact. To date, this effort appears to be fairly successful at motivating buildings to work toward the 30% carbon reduction goal (with six buildings having already met this goal). A potential recommendation could be to work with the Governor to set up a statewide challenge focused specifically on energy efficiency and with a target audience of EFP eligible commercial buildings. EFP could then use the challenge context to recruit new participants and encourage them to set higher energy-efficiency goals.

Appendix B: Workshop Agenda

Applying Behavioral Strategies to Energy Decisions and Behaviors

June 18-19, 2014

DAY ONE: LEARNING FROM EXPERIENCE

WEDNESDAY, JUNE 18, 2014

PACE LAW SCHOOL, PRESTON HALL, TUDOR ROOM
78 NORTH BROADWAY, WHITE PLAINS, NEW YORK

10:00 am – 10:15 am	**Opening Remarks** **Marsha L. Walton**, Senior Project Manager, Buildings R&D and Behavior Research, New York State Energy Research and Development Authority **Maxine L. Savitz**, Vice President, National Academy of Engineering; General Manager, Honeywell, Inc., retired; Co-chair, Alternative Energy Future project, American Academy of Arts and Sciences **Richard Ottinger**, Founder, Pace Energy and Climate Center; Dean Emeritus, Pace University Law School; former Congressman (D-NY)
10:15 am – 11:00 am	**Keynote Talks** Introductions: **Marsha L. Walton**, NYSERDA **Karen Ehrhardt-Martinez**, Principal, Human Dimensions Research: *The Efficiency Gap and Potential of Behavioral Strategies* **Susan Mazur-Stommen**, Director, Behavior and Human Dimensions Program, American Council for an Energy Efficient Economy: *Examples of Behavioral Utility Programs*
11:00 am – 12:00 pm	**Panel Discussion: Designing and Evaluating Behavioral Projects** Moderator: **Marsha L. Walton**, NYSERDA Speakers:

P. Wesley Schultz, Professor of Psychology, California State University, San Marcos; Founder and Scientific Advisor, Action Research

Jennifer Tabanico, President and Owner, Action Research

Jane S. Peters, President and Owner, Research into Action

12:00 pm – 1:15 pm **Lunch**

Keynote speaker: Philip E. Rubin, Principal Assistant Director for Science and Assistant Director for Social, Behavioral and Economic Sciences, White House Office of Science and Technology Policy: *Public Policy as Embodied Action*

Introduction: **Maxine L. Savitz**, National Academy of Engineering; General Manager, Honeywell, Inc., retired

1:15 pm – 2:15 pm **Panel Discussion: Results from Clean Energy Programs that Have Used Behavioral Strategies**

Moderator: **Linda Schuck**, Senior Advisor, California Institute for Energy and Environment

Panelists:

Annika Todd, Senior Scientific Engineering Associate, Electricity Markets and Policy Group, Lawrence Berkeley National Laboratory

Lupe Jimenez, Demand Response R&D Program Manager, Sacramento Municipal Utility District

Briana Kane, Senior Residential Program Coordinator, Cape Light Compact

2:15 pm – 2:30 pm **Coffee Break**

2:30 pm – 3:45 pm **Preliminary Results from New Research Programs – Round 1**

Moderator: **Paul Stern**, Senior Scholar, U.S. National Research Council/National Academy of Sciences

Presenters:

Marcos Pelenur, Head of Energy & Sustainability, UK Behavioural Insights Team: *Applying behavioural insights to energy use in the UK: lessons from the field*

Sébastien Houde, Assistant Professor of Economics, University of Maryland: *Information, framing and the adoption of energy-intensive durables*

Easan Drury, Senior Engineer, Strategic Energy Analysis Center, National Renewable Energy Laboratory: *Running randomized controlled experiments to better understand household-level motivations for adopting rooftop solar panels*

Varun Rai, Assistant Professor of Public Affairs, University of Texas at Austin: *Connecting the dots between theory, simulation, and experiments*

3:45 pm – 5:00 pm

Preliminary Results from New Research Programs – Round 2

Moderator: **Thomas Dietz**, Professor of Sociology and Environmental Science and Policy, Michigan State University

Presenters:

Constantine Kontokosta, Deputy Director, Center for Urban Science and Progress (CUSP), New York University: *Modeling, predicting, and influencing energy behavior in commercial tenants and homeowners: an overview of two current research initiatives*

Edy Moulton, Research Coordinator, Columbia University: *Building better infrastructure through choice architecture: A SUSSTAIN collaboration*

Inês Azevedo, Associate Professor, Engineering and Public Policy and Co-Director, Center for Climate and Energy Decision-Making (CEDM), Carnegie Mellon University: *Assessing the effect of an efficiency appliance rebate program on energy consumption*

James Kimmel, Behavioral Scientist, ideas42: *Does giving comparative fuel cost information to potential car buyers affect purchasing behavior?*

5:00 pm – 5:15 pm

Day One Wrap-up

John Randell, Program Officer for Science Policy, American Academy of Arts and Sciences

CROWNE PLAZA HOTEL
66 HALE AVENUE, WHITE PLAINS, NEW YORK

6:00 pm **Reception and Poster Session**

POOL PATIO AREA

Poster presenters are requested to arrive by 5:45 to set up posters

7:00 pm **Dinner**

BRIARCLIFF

Keynote Speaker: **Andrew C. Revkin**, Senior Fellow for Environmental Understanding, Pace University

DAY TWO: INFORMING THE DESIGN OF ENERGY PROGRAMS

THURSDAY, JUNE 19, 2014

PACE LAW SCHOOL, PRESTON HALL, TUDOR ROOM

Continental breakfast available beginning at 8:30 am

9:00 am – 9:15 am

Goals for the Day

Marsha L. Walton, NYSERDA

9:15 am – 10:00 am

Plenary Talk: Why Behavioral Strategies Need to be Included in Clean Energy Programs – And How to Do It

Speaker: **Anne Dougherty**, Advisor and Co-Owner, Illume Advising, LLC

10:00 am – 10:50 am

Breakout Session #1: Identifying and Understanding Barriers to Applying Behavioral Strategies to Existing Utility Programs

3. Identifying and understanding barriers:
   - What are the structural/financial/regulatory barriers?
   - What are programmatic barriers to running pilot approaches that may be unproven?
4. What are some potential solutions to these barriers?

10:50 am – 11:00 am

Break

11:00 am – 12:00 pm

Responses to Challenges Identified in Breakout Groups

Moderator: **Alexandra Dunn**, Senior Project Analyst, Research into Action

Respondents:

Anne Dougherty, Illume Advising, LLC

Michael Goldman, Senior Research Analyst, Energy Efficiency, Northeast Utilities

P. Wesley Schultz, California State University, San Marcos; Action Research

Edward Vine, Staff Scientist (Rehired Retiree), Lawrence Berkeley National Laboratory; Manager, Environmental

Program at the California Institute for Energy and Environment

12:00 pm – 1:00 pm **Lunch**

1:00 pm – 2:00 pm **Breakout Session #2: Opportunities and Next Steps**

Track A: Identifying Research Gaps and Next Steps

1. Prioritizing programs for behavioral interventions:
   - Where is the greatest need for new field experiments?
   - What information do we need to establish a longer-term research agenda?
2. Where are the most promising opportunities for future collaboration among researchers, government programs, and the private sector?
3. How could the lessons from this workshop be transmitted broadly to scholars, program managers, and policy makers?

Track B: Integrating Behavior Strategies into NYSERDA Programs

2:00 pm – 3:00 pm **Reporting from Breakout Groups (Track A)**

Moderator: **Maxine L. Savitz**, National Academy of Engineering; Honeywell, Inc., retired

Respondents:

Elaine Ulrich, Acting Soft Costs Program Manager, SunShot Initiative, U.S. Department of Energy

Garry Brown, Commissioner, New York State Public Service Commission

Adam Diamant, Technical Executive, Energy and Environmental Analysis Program, Electric Power Research Institute

Elke Weber, Jerome A. Chazen Professor of International Business, Columbia Business School; Professor of Psychology and Earth Institute Professor, Columbia University

3:00 pm – 4:00 pm **Reporting from Breakout Groups (Track B)**

Moderator: **Marsha L. Walton**, NYSERDA

Panelists:

Jennifer Tabanico, President, Action Research

P. Wesley Schultz, California State University, San Marcos; Action Research

Jessica Nolan, Consultant, Action Research; Associate Professor of Psychology, University of Scranton

4:00 pm **Closing Remarks and Adjourn**

With appreciation to the workshop co-sponsors:

Appendix C: Speaker Biographies

Inês M. L. Azevedo is Associate Professor at the Department of Engineering and Public Policy at Carnegie Mellon University and the Co-Director for the Climate and Energy Decision Making center. Prof. Azevedo has participated as a committee member and co-author in two reports from the National Research Council. She was a co-author in the Global Energy Assessment from IIASA. She has received an Early Career Award from the Dean of the Carnegie Institute of Technology, awarded to untenured faculty members who have received exceptionally strong support during their review for promotion. She was awarded by the World Economic Forum a "40-scientists under 40" award in 2014. Her work focuses on solving problems that include social, environmental, technical, economic, and policy aspects that combine social sciences and engineering approaches. She has a Ph.D. in Engineering and Public Policy from Carnegie Mellon University, a M.Sc. Engineering Policy and Management of Technology, and a 5-year B.Sc. degree in Environmental Engineering both from the Technical University of Lisbon-Portugal.

Garry Brown is a Commissioner with the New York State (NYS) Public Service Commission. He has more than 35 years of experience in the energy and electricity sectors. He had been Vice President, External Affairs and Vice President, Strategic Planning for the New York Independent System Operator; Manager of Government and Market Relations for Sithe Energies, Inc.; and a Senior Policy Analyst for the former NYS Energy Office. Mr. Brown is the President of the Mid-Atlantic Conference of Regulatory Utilities Commissioners. He has served on the Board of Directors of numerous organizations including the Regional Greenhouse Gas Initiative, the New York State Energy and Research and Development Authority, the New York State Siting Board, and the National Association of Regulatory Commissioners (NARUC). He formerly chaired the Electricity Committee at NARUC and served on the Advisory Council to the Board of Directors of the Electric Power Research Institute.

Adam Diamant is a Technical Executive in the Energy and Environmental Analysis program at the Electric Power Research Institute (EPRI). He manages EPRI's research activities related to natural gas and coal fuel markets, generation planning and corporate risk management. In addition, he conducts research on the evolution of international greenhouse gas (GHG) emissions trading programs, and the development and evolution of GHG offset programs and new categories of emissions offsets. Prior to joining EPRI, he founded and operated a private consulting firm that specialized in economic and policy analysis of key energy and environmental issues. Previously, Mr. Diamant also worked in the Executive Office of the President of the United States where he was responsible for oversight of the regulatory programs of the U.S. Department of the Interior and the U.S. Forest Service.

Thomas Dietz is Professor in Environmental Science and Policy (ESPP), Sociology and Animal Studies at Michigan State University, where he was founding Director of ESPP, is Co-Director of the Great Lakes Integrated Sciences and Assessments Center and a member of the Center for Systems Integration and Sustainability. He holds a B.G.S. from Kent State University and a Ph.D. in Ecology from the University of California, Davis. His research interests include environmental decision making, linking science and values in policy processes, the relationship between ecosystems and human well-being, and structural human ecology. He has published 13 books and over 130 papers and book chapters, including, since the 1980s, more than 20 on energy. Professor Dietz is a Fellow of the American Association for the Advancement of Science, and has been awarded the Sustainability Science Award of the Ecological Society of America as well as several research awards from the American Sociological Association.

Anne Dougherty is an Advisor and Co-Owner of Illume Advising LLC. Ms. Dougherty brings a decade of experience in social science-driven research techniques to her clients. She is a skilled program design, research, and evaluation consultant specializing in the human dimensions of energy resource management with particular expertise in behavioral programs and customer-facing smart grid technologies. Ms. Dougherty actively collaborates with regulators, utilities, and program implementers on how to understand and make effective use of behavioral programs to meet energy savings goals. In this capacity, she has participated in a workshop on experimental design presented by the California Public Utilities Commission, delivered talks on pilot design and setup for evaluation, recently completed a training on behavioral program evaluation for the International Energy Program Evaluation Conference, and is one of a team of experts who recently authored a white paper to advance behavioral programs in the state of California and holds multiple professional appointments in the energy services industry. Ms. Dougherty holds a M.S. in the Social Sciences from the University of Chicago.

Easan Drury is a senior engineer at the National Renewable Energy Laboratory. His research focuses on characterizing the market potential for renewable energy technologies by developing various models ranging from technology diffusion models for distributed generation technologies—rooftop solar, distributed wind and batteries—to utility-scale capacity expansion models. Recently, his research has focused on understanding household-level motivations for adopting rooftop solar panels and improving modeled representations of customer behavior. Drury has a B.S. in physics from the University of California, Berkeley, and a Ph.D. in engineering sciences from Harvard University.

Alexandra Dunn is a research and statistical analyst, cognitive psychologist, and linguist. She has conducted experimental and quasi-experimental research for more than six years, including three with Research Into Action. At Research Into Action, she specializes in advanced research methods, including developing research designs to effectively assess behavioral interventions and planned program changes. Drawing on her cognitive psychology background, recently she has applied behavior change theories to identify opportunities to incorporate behavior change strategies into existing program designs. She conducts quantitative analyses of complex datasets using techniques that include structural equation modeling, meta-analysis, regression modeling, and hierarchical linear modeling. Dunn earned her Ph.D. in cognitive psychology from the University of California, Santa Cruz, and a B.S. in cognitive science from the University of California, Berkeley.

Karen Ehrhardt-Martinez is internationally recognized for her work on the human dimensions of energy efficiency, conservation and environmental sustainability. She has more than 20 years of experience working as a consultant, program manager and researcher (both quantitative and qualitative). Her work has focused on helping policymakers, planners, real estate professionals, utilities, and nonprofits work more effectively to shift energy use practices, reduce energy consumption and eliminate energy waste in homes and commercial buildings in the U.S. and abroad. In this capacity, she has worked collaboratively with the U.S. Green Building Council, the Urban Sustainability Director's Network, the California Institute for Energy and Environment, the International Energy Agency, ACEEE, the SmartGrid Consumer Collaborative and numerous other organizations. Dr. Ehrhardt-Martinez is a cofounder of the nationally recognized, Behavior, Energy and Climate Change (BECC) Conference, serving as the 2009 BECC Conference Chair, and has provided expert testimony before the U.S. House Committee on Science and Technology's Subcommittee on Energy and Environment. She currently serves

as the founder and Director of Human Dimensions Research Associates and is a Senior Research Associate with the Department of Sociology at Colorado State University. Prior to her current position, she directed the Climate, Mind, and Behavior Program at the Garrison Institute and established the social and behavioral research program at ACEEE. She is a co-author of two chapters in a forthcoming publication on the sociology of climate change (Oxford University Press) and a member of the editorial board for Energy Efficiency.

Michael Goldman is a Senior Research Analyst at Northeast Utilities (NU) focusing on behavioral energy efficiency programs at NSTAR Electric, NSTAR Gas, and the Western Massachusetts Electric Company. He is currently serving as the behavioral evaluation lead for the Massachusetts statewide Evaluation Management Committee. He will be speaking at the 2014 ACEEE Summer Study on Energy Efficiency in Buildings on the possibility of better integrating behavioral programs into utility energy efficiency portfolios and has previously served as a peer reviewer for many related papers and panels. Prior to NU, Michael worked as a management consultant in the energy and resources industry focusing on financial analysis in the generation, transmission, and environmental retrofit sectors. He received a B.A. from the University of Wisconsin-Madison and an M.A. degree in economics and energy policy from Johns Hopkins University.

Sébastien Houde is an Assistant Professor at the University of Maryland in the Department of Agricultural and Resource Economics. He received his Ph.D. from Stanford University. He has interests in energy and environmental economics. His research focuses on investigating different policy tools used to manage energy demand, address climate change, and better design energy systems. His current research projects investigate the welfare effects of minimum energy efficiency standards, and the role of market-based instruments and information to address environmental externalities.

Lupe Jimenez is currently the Program Manager for SMUD's Energy Research and Development Demand Response programs. The program portfolio includes research pilots for dynamic pricing, electric vehicle demand response, and enabling technology that encourage behavior changes, automation and control for residential customers. Prior to joining the SMUD team, her career in market intelligence included green and energy efficiency utility programs, real estate development, marketing, and public policy as a research professional.

Briana Kane is the Senior Residential Program Coordinator at the Cape Light Compact. Briana has 14 years of experience in government and has been with Barnstable County for the last 10 years. She has an environmental background and received her B.A. in Resource Economics from the University of Massachusetts, Amherst. Briana coordinates the following residential programs for the Compact: Lighting, Appliances & Electronics, Low Income Single Family, Low Income Multi-Family, as well as working on the Mass Save Statewide Marketing Initiative and the Compact's Behavior Initiative.

Jamie Kimmel is a Researcher at Facebook, and over the past year has used insights from behavioral economics to design products and programs with Stanford and the City of Seattle. During the time of the workshop, Jamie was a Senior Associate at ideas42, a consulting firm that uses insights from behavioral economics to design policies, programs, and services for social good. While at ideas42, Kimmel worked with organizations such as the Gates Foundation, the World Bank, and the City of Chicago on behaviorally-informed interventions aimed at improving student outcomes in college, fostering water conservation, and encouraging energy

benchmarking, respectively. Jamie also led a study with MIT to examine the effects of annual and long-term fuel cost information on vehicle purchases.

Constantine E. Kontokosta, PhD, PE, is the Deputy Director (Academics) at the NYU Center for Urban Science and Progress (CUSP), an Assistant Professor of Urban Informatics jointly at CUSP and the NYU Tandon School of Engineering, and the Principal Investigator and Head of the CUSP Quantified Community Research Lab. Constantine was part of the CUSP founding leadership team, setting the Center's strategic priorities and assisting in the design of the academic and research programs, growing from two to over 50 faculty and staff and 100 graduate students. At CUSP, he also leads Urban Sustainability Informatics research group, which has focused on using energy benchmarking data to drive carbon reductions in cities, and serves as Faculty Engineer in Residence at the NYU Tech Incubators. Constantine's research lies at the intersection or urban policy and planning, data science, and systems engineering, and he has worked on analytics projects with a range of city agencies to support improved city operations and planning. He holds a Ph.D., M.Phil, and M.S. in Urban Planning, specializing in econometrics, from Columbia University, a M.S. in Real Estate Finance & Economics from New York University, and a B.S.E. in Civil Engineering Systems from the University of Pennsylvania.

Susan Mazur-Stommen is a cultural anthropologist who has researched culture, behavior, and sustainability for over twenty years. Dr. Mazur-Stommen is a sought after speaker on behavior and sustainability who has recently spoken on user centered product design, the meanings of brands, and the consumer perspective. She is a well-known researcher and author whose work on a variety of topics ranging from appliances to Nazis has been published in peer reviewed journal articles and books from academic presses, as well as trade journals and other media publications. Dr. Mazur-Stommen earned her Bachelor of Arts in Cultural Anthropology from San Jose State University, and, as an undergraduate, looked at Iranian-American marriage choice using ethnographic decision tree modeling. She received both a Master of Arts and a Doctorate in Cultural Anthropology from the University of California, Riverside. She was the co-chair for the Behavior, Energy, and Climate Change conference from 2011-2014, and currently serves on the boards of non-profits Project Porchlight and EcoWomen. Dr. Mazur-Stommen founded Indicia Consulting LLC in 2006 as a way to bring the tools and insights from cultural anthropology to a wider audience. Indicia Consulting is a mission-driven social enterprise which defines its primary goal as seeking an increase in sustainability and improvement in the natural environment by engaging behavior. Indicia's clients include Bosch, Embertec, Lawrence Berkeley National Laboratories, and IQ Energy.

Edy Moulton is a project manager for the research coordination network SUSSTAIN and a graduate student at Columbia Business School (Fall 2014). She is presenting on behalf of SUSSTAIN, an interdisciplinary, multi-institution network founded by Elke Weber and Ruth Greenspan Bell and comprised of specialists in the social sciences, law, policy and business. It seeks to demonstrate how insights from the behavioral and social sciences can be put to work on energy consumption challenges in real-world applications. SUSSTAIN is working with the American Academy of Arts and Sciences to build a directory of individuals and organizations who share this goal.

Jessica M. Nolan is an Associate Professor of Psychology at the University of Scranton and a scientific advisor for Action Research. She received her B.S. in natural resources from Cornell University, her M.A. from California State University, San Marcos, and her Ph.D. in experimental psychology from the University of Arkansas. Her research has focused on the

application of social influence tools (*e.g.*, social norms) to promote pro-environmental behaviors. She is also interested in how environmental policies influence the normative regulation of behavior and individuals' willingness to confront environmental transgressors. Nolan previously worked as a recycling outreach and education specialist for the City of Cambridge.

Richard L. Ottinger is Dean Emeritus of the Pace Law School. He was Dean from 1994-1999. He joined the Faculty in 1984 as Professor of Law and University Distinguished Professor of Public Policy and Law, teaching in the Environmental Law Program. He serves as Co-Director of the Pace Center for Environmental Legal Studies and started its Pace Energy & Climate Center. Prior to coming to Pace, Dean Ottinger served eight terms in the United States Congress from Westchester County, New York where he authored a substantial body of energy and environmental law. He was one of the earliest environmentalists in Congress, founding the Environmental and Energy Study Conference, the then largest bipartisan, bicameral caucus in Congress (now EESI). As Chair of the House Energy Conservation and Power Subcommittee, he was instrumental in the adoption of many of the key environmental statutes and was principal author of the Public Utility Regulatory Policy Act. After military service as a Captain in the United States Air Force during the Korean War, Dean Ottinger was an Associate in the firm of Cleary, Gottlieb, Friendly & Hamilton. He then was a founding staff member of the United States Peace Corps until successfully running for the U.S. Congress in 1964.

Marcos Pelenur is the Head of Energy and Sustainability for the Behavioural Insights Team. He leads the team's work across a range of policy areas with industry and government departments, such as using behavioural insights to improve energy efficiency, encourage sustainable travel, and increase recycling. He has been with the team for two years, having first joined as a civil servant from the Cabinet Office. Prior to this, Pelenur worked as a Project Engineer and Manager for an international smart meter and energy management company. Marcos holds a Ph.D. and M.Phil. in Engineering for Sustainable Development from the University of Cambridge. He is also a Chartered Engineer, Member of the Institution of Engineering and Technology, and holds a leadership position with Engineers Without Borders UK.

Jane S. Peters is President and Owner of Research Into Action. She has more than 30 years of experience in energy-related program evaluation, market assessment, evidenced based programs, strategic planning, and organizational analysis. She has conducted research on all types of programs: residential, commercial/institutional, industrial, residential/low-income, agricultural, research and development, demand response, end-use renewables, and distributed generation. She is particularly interested in determining how best to design and implement programs that spur individuals and organizations to reduce their energy use and other actions that contribute to climate change. Dr. Peters is a member of the Evaluation, Measurement, and Verification (EM&V) training team for the Association of Energy Services Professionals. In 2013, the International Energy Program Evaluation Conference (IEPEC) recognized her contributions to the industry by presenting her its Lifetime Achievement Award. She earned her Ph.D. in urban studies from Portland State University, and received a B.A with distinction in psychology from Occidental College.

Varun Rai is an Assistant Professor at the LBJ School of Public Affairs at the University of Texas at Austin, where he directs the Energy Systems Transformation Research Group. He studies technological change in energy, with a focus on the barriers in the energy innovation-diffusion process. His research combines energy systems modeling with the political economy of energy markets to understand how changes in energy technologies, market conditions, policies and regulation, and environment could impact energy generation. He has presented at several

forums, including United States Senate Briefings, Global Economic Symposium, and Climate One at Commonwealth Club. His research has been discussed in *The New York Times*, *The Wall Street Journal*, *Washington Post*, and Bloomberg News. He was a Global Economic Fellow in 2009 has held the Elspeth Rostow Centennial Fellowship since 2010. In July 2013 he was appointed as a Commissioner for the vertically-integrated electric utility Austin Energy, City of Austin (Texas). Rai received his Ph.D. and M.S. in Mechanical Engineering from Stanford University and a bachelor's degree in Mechanical Engineering from the Indian Institute of Technology (IIT) Kharagpur.

John Randell is Program Officer for Science Policy at the American Academy of Arts and Sciences, where he oversees the Academy's programs in science and technology policy and also serves on the senior management team. Since 2010 he has been the staff director for the Alternative Energy Future project, which seeks to facilitate interdisciplinary studies of critical energy issues that require increased attention from social scientists. He is also the staff director for a recent American Academy report on public trust in childhood vaccinations and a forthcoming report on long-term planning in U.S. science and technology policy. Randell joined the Academy in 2009 as a Hellman Fellow in Science and Technology Policy, and was previously a postdoctoral fellow at Massachusetts Institute of Technology from 2003-2009. He was a visiting assistant professor of microbiology at Kathmandu University Medical School in 2001. Randell holds a Ph.D. in virology from Harvard University and undergraduate degrees in mathematics and microbiology from the University of Iowa.

Philip Rubin is the Principal Assistant Director for Science in the Office of Science and Technology Policy (OSTP) in the Executive Office of the President of the United States. His responsibilities also include leading their efforts in the area of neuroscience and serving as the co-chair of the National Science & Technology Council's Committee on Science. He is on leave as the Chief Executive Officer at Haskins Laboratories in New Haven, Connecticut, which has a primary focus on the science of the spoken and written word, including speech, language, and reading. Rubin is also on leave as a Professor Adjunct in the Department of Surgery, Otolaryngology at the Yale University School of Medicine and a Research Affiliate in the Department of Psychology at Yale University. From 2000-2003 Rubin was the Director of the Division of Behavioral and Cognitive Sciences at the National Science Foundation. He is a Fellow of the American Association for the Advancement of Science, the Acoustical Society of America, the American Psychological Association, and the Association for Psychological Science. From 2006-2011 he served as Chair of the National Academies' National Research Council Board on Behavioral, Cognitive, and Sensory Sciences, and was a member-at-large of the Executive Committee of the Federation of Associations in Behavioral and Brain Sciences.

Maxine Savitz is the retired General Manager of Technology Partnerships at Honeywell, Inc. During her time at Honeywell, she oversaw the development and manufacturing of innovative materials for the aerospace, transportation, and industrial sectors. From 1979 to 1983, she served as Deputy Assistant Secretary for Conservation in the U.S. Department of Energy. She currently serves as Vice President of the National Academy of Engineering. She serves on advisory bodies for the Sandia National Laboratory and Pacific Northwest National Laboratory, and is a member of the board of directors of the American Council for an Energy Efficient Economy. She served on the National Academy's Committee on America's Energy Future and was Vice-Chair of the Energy Efficiency Committee. She is Vice-Chair of the President's Council of Advisors for Science and Technology. She was elected a Fellow of the American Academy of Arts and Sciences in 2013 and co-chairs its Alternative Energy Future project.

Linda Schuck is a Senior Advisor at the California Institute for Energy and Environment (CIEE). She has 25 years of experience working on energy efficiency, technology commercialization, and climate change. Her work at CIEE is focused on expanding behavior and decision research and its use in energy and climate policy and technology commercialization. She founded and chaired the Behavior, Energy and Climate Change Conference, which is the preeminent forum for researchers, policymakers, and implementers to discuss social science research and its application to climate and energy challenges. Prior to joining CIEE, Schuck directed the California Climate Change Project at Stanford University, an inter-university collaboration to facilitate the use of research in the design, adoption, and implementation of strategies to reduce greenhouse gas emissions. She has held managerial positions at the US Department of Energy, Pacific Gas & Electric Company, and the Alliance to Save Energy, and has served as a management consultant to the California Energy Commission, Southern California Edison, Bonneville Power Administration, American Council for an Energy-Efficient Economy, and numerous other organizations. Schuck also has extensive experience managing social science-based research (including program/evaluation research and marketing/customer/advertising/brand research) and conducting experimentally designed research programs. She co-founded the Utility Customer Satisfaction Research Network, served on the advisory board of the International Energy Program Evaluation Conference and on the organizing committee for ACEEE Summer Study for many years. She also works on clean technology commercialization and served on the Advisory Board of the Environmental Business Cluster, a clean energy technology incubator. She currently serves on the Advisory Board of the Center for Research on Environmental Decisions at Columbia University. She holds an M.B.A. from Stanford University, an M.A. from Antioch Graduate School, and a B.A. from Stanford University.

P. Wesley Schultz is Professor of Psychology at California State University, San Marcos. Professor Schultz is an expert in the areas of behavior and attitude change, conservation psychology, and statistics. He has published extensively in these areas, with recent books on the *Psychology of Sustainable Development* (Kluwer, 2002), *Attitudes and Opinions* (Erlbaum, 2005), and *Social Marketing to Protect the Environment* (Sage, 2011). Over the past 10 years, he has published more than 50 articles in some of the leading scientific journals. He has conducted research and served as a technical expert for a range of private and public entities, including the National Science Foundation, Environmental Protection Agency, U.S. Department of Energy, U.S. Department of Justice, the National Institutes of Health, and Opower. He has also worked with a number of energy utilities, including San Diego Gas and Electric (SDG&E), Olivenhain Municipal Water District, the Vallecitos Water District, and Southern California Edison.

Jennifer Tabanico is President and owner of Action Research, a firm specializing in changing human behavior through the application of traditional marketing techniques blended with empirical insights from the social and behavioral sciences. Ms. Tabanico is a recognized leader in community-based social marketing and has more than a decade of experience developing and implementing behavior change programs for public and private agencies. Her most recent clients have included the City and County of San Diego, the New York State Energy Research and Development Authority, and the Urban Sustainability Directors Network. She is also a seasoned researcher and has designed and directed numerous behavioral experiments in both laboratory and field environments. Her work has been published in technical and academic outlets including the *Journal of Environmental Psychology*, *Social Influence,* and *Criminology.* She has worked with NYSERDA since 2010 and is skilled in facilitating communication between academic groups and clean energy program staff.

Annika Todd is an experimental and behavioral economist. She conducts policy-oriented research on energy efficiency, demand response, and smart grid topics at Lawrence Berkeley National Laboratory. Her research has included investigating the effect of pricing and behavior-based factors on energy consumption through large-scale field experiments, including the effect of dynamic pricing, smart sensor technology, high frequency feedback, competition, micro-raffle incentives, information overload, and social incentives. She also investigates the benefits and limitations of new forms of data that are becoming available with the rollout of smart meters, smart thermostats, and other technology devices. Previously, she was at the Precourt Energy Efficiency Center at Stanford where she worked as part of a team to carry out experimental behavioral research for the U.S. Department of Energy's Advanced Research Projects Agency - Energy. She was also a co-chair of the Behavior, Energy & Climate Change (BECC) conference in 2010. She has a Ph.D. in Economics from Stanford University, and holds a B.A. in Molecular and Cell Biology as well as a B.A. in Economics from the University of California, Berkeley. She has extensive experience in experimental design, program evaluation, behavioral theory, statistical and econometric analytics, behavioral financial markets, and game theory.

Elaine Ulrich manages SunShot's balance of systems program, which works to reduce the non-hardware (soft costs) of solar, lower barriers to solar adoption, and foster market growth. A former American Association for the Advancement of Science Fellow, Ulrich has spent the past few years working on renewable energy. She previously held positions in the office of former U.S. Senator Ken Salazar, U.S. House of Representatives Committee on Science and Technology, the Energy Department's Office of Strategic Planning and Analysis, and in the office of U.S. Representative Gabrielle Giffords, where she worked to build a comprehensive solar energy portfolio. Ulrich holds a B.A. in physics from Wellesley College and a Ph.D. in optical science from the University of Arizona.

Edward Vine is a Staff Scientist (Rehired Retiree) at the Lawrence Berkeley National Laboratory (LBNL), where he has been involved in the evaluation of energy efficiency programs and technology performance measurement for over 36 years. Vine is also a Program Manager at the California Institute for Energy and Environment where he leads the Planning and Evaluation Program. Dr. Vine has been involved in the field of behavior and energy use since his initial work at LBNL in the early 1980s in statistical modeling of energy use in households using both engineering and behavioral variables. Since then, he has worked on behavioral issues such as energy lifestyles, thermostat management, office worker response to energy-efficient windows, and factors affecting the evaluation of energy-efficiency projects and programs (including persistence and the rebound effect). He recently completed a paper on energy reduction competitions for the California Public Utilities Commission. He holds a B.S. in Environmental Studies from Middlebury College and a M.S. and a Ph.D. in Ecology from the University of California, Davis. In 2007, as a member of the Intergovernmental Panel on Climate Change (IPCC), he received the Nobel Peace Prize.

Marsha Lia Walton is Senior Project Manager in NYSERDA's Buildings Research Program and is responsible for managing the Behavior Research Program and Lighting Research Program at NYSERDA. Before joining NYSERDA in 1992, she was employed by the New York State (NYS) Department of Public Service, where she had oversight responsibility for New York utilities' energy-efficiency programs. Prior to her New York State service, Marsha worked as an anthropologist and field camp manager in Alaska for the Bureau of Indian Affairs Alaska Native Claims Settlement Act Special Projects Office. Walton has a bachelor's degree. in Social Studies (with concentration in Cultural Anthropology) from Bard College, a M.R.P. (master's degree in

Regional Planning) from Cornell University, and a Ph.D. in Ecological Economics from Rensselaer Polytechnic Institute.

Elke Weber is the Jerome A. Chazen Professor of International Business as well as a Professor of Psychology and Earth Institute Professor at Columbia University, with a Ph.D. from Harvard. She is an expert on behavioral and neural models of judgment and choice under uncertainty and time delays. Professor Weber is past president of the Society for Mathematical Psychology, the Society for Judgment and Decision Making, and the Society for Neuroeconomics. She is a member of the German National Academy of Sciences and has served on advisory committees of the U.S. National Academy of Sciences related to human dimensions in global change. At Columbia, she founded and co-directs the Center for the Decision Sciences (CDS) and the Center for Research on Environmental Decisions (CRED), which investigates ways of facilitating human adaptation to climate change and climate variability. With Ruth Greenspan Bell from the Woodrow Wilson Center, she codirects an NSF Research Coordination Network for the Utilization of Social Science Research on Sustainability and Energy. She is a Lead Author in Working Group III for the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

Appendix D: Poster Presentations and Presenters

Aligning the factors that promote behavior change for programmable thermostats
Joana Abreu and Kurt Roth **(***Fraunhofer USA Center for Sustainable Energy Systems)*

BAS Operational Effectiveness
Michael Bobker, Honey Berk, and Manorge Joseph (*CIUS Building Performance Lab, City University of NY*)

Contractor-Led Social Marketing to Promote Energy Efficient Decisions and Behaviors in the Residential Sector
Kathryn A. Caldwell (*Ithaca College*), Mary Kate Wheeler and Jon Harrod, (*Snug Planet*)

Reducing Energy Consumption in the Government of Western Cape
Saugato Datta, Martine Visser, Justine Burns, Matthew Darling, and Ruirui Kuang (*ideas42*)

Bridging the Gap—Engaging Households in Idaho and Eastern Washington through a Home Energy Report Program
Leona Doege (*Demand-Side Management*), Jon Powell, (*Partnership Solutions*), and Mike Whittier (*Opower*)

Shifting the participation threshold: How leveraging Connected Mavens in a community can spur behavior change
Alexandra Dunn, Dulane Moran, and Jane S. Peters (*Research Into Action*)

The Influence of Novel Behavioral Strategies in Promoting the Diffusion of Solar Energy
Kenneth Gillingham (*Yale University*) and Bryan Bollinger (*New York University*) on behalf of *Solar Evolution and Diffusion Studies (SEEDS)*

Design of Social and Economic Incentives and Information Campaigns to Promote Solar Technology Diffusion through Data-Driven Behavior Modeling
Kiran Lakkaraju (*Sandia National Labs*) and Eugene Vorobeychik (*Vanderbilt University*) on behalf of the California Center for Sustainable Energy Team and the National Renewable Energy Lab of the Wharton School of Business at the University of Pennsylvania

Behavioral Demonstrations Program
James Mannarino and Sophie Cardona (*NYSERDA*)

Vermont Home Energy Challenge
Paul Markowitz (*Vermont Energy Investment Corporation*)

Price Saliency and Social Comparisons as Policy Instruments to Encourage Energy Conservation: Evidence from a Field Experiment"

Jose A. Pellerano (*Universidad Iberoamericana*), Michael K. Price (*Georgia State University*), Steven L. Puller, and Gonzalo E. Sanchez (*Texas A&M University*)

Investigating Opportunities for Improving Building Performance through Simulation of Building Occupancy and Occupant Behavior
Handi Chandra Putra, Clinton Andrews, MaryAnn Sorensen Allacci, Jennifer Senick, and Deborah Plotnik (*Rutgers Center for Green Building*)

The Smart Housing Project: Motivating Resource Conservation through Real-Time Feedback & Education
Amanda Sherman, Mark Bayer, Alan Schay, Lisa Legault, Stephen Bird, and Susan Powers (*Clarkson University*)

Social Marketing to Install Energy Efficient Lighting
Sara Silverstone (*Behavior Research Institute*), Marcie Desrochers (*The College at Brockport – SUNY*), Tal Eyal, and Aaron Mehta (*FS Energy*)

Filling Gaps in Research and Moving Ahead in Ithaca / Tompkins County
Lisa A. Skumatz *(Skumatz Economic Research Associates: SERA*)

Dynamic messaging to increase use of light switches
Jeremy Snyder, Mark Rea, and Michael Kalsher (*Lighting Research Center, Rensselaer Polytechnic Institute*)

Encouraging residential selection of renewable energy suppliers.
Janet K. Swim (*Pennsylvania State University*) on behalf of the Senior Capstone Psychology Class

Computer Power Management by Municipal Employees: A Multi-Agency Community-Based Social Marketing Pilot
Jennifer J. Tabanico (*Action Research*), Jill Boone (*Santa Clara County, CA*), Lori Brown Large (*Action Research*), and Julia Parzen (*Urban Sustainability Directors Network*)

Appendix E: Participant List

Workshop on Applying Behavioral Strategies to Energy Decisions

June 18-19, 2014
Pace Energy and Climate Center
White Plains, NY

Joana Abreu
Fraunhofer USA

Amy Adams
NYSEG/RG&E

Doug Arent
National Renewable Energy Laboratory

Ines Azevedo
Carnegie Mellon University

Todd Baldyga
NYSERDA

Ruth Bell
Wilson Center; World Resources Institute

Honey Berk
CUNY Institute for Urban Systems, City College

Stephen Bird
Clarkson University

Michael Bobker
CUNY Institute for Urban Systems

Joseph Borowiec
NYSERDA

Garry Brown
NY State Public Service Commission

Lauren Brust
Steven Winter Associates, Inc.

Kathryn Caldwell
Ithaca College

Sophie Cardona
NYSERDA

Adam Cohen
U.S. Department of Energy

Michael Colgrove
NYSERDA

Cristina Coltro
Consolidated Edison, Inc.

Alex Davis
Carnegie Mellon University

Marcie Desrochers
Brockport Research Inc.

Adam Diamant
Electric Power Research Institute

Tom Dietz
Michigan State University

Anne Dougherty
Illume Advising, LLC

Peter Douglas
NYSERDA

Easan Drury
National Renewable Energy Laboratory

Alexandra Dunn
Research into Action

Karen Ehrhardt-Martinez
Human Dimensions Research

Douglas Elfner
NY State Public Service Commission

Rene Eyerly
City of San José

Joni Fish-Gertz
NYSEG/RG&E

Bruce Folsom
Avista Utilities

Michael Goldman
NSTAR

Elisabeth Harrod
Snug Planet

Sebastien Houde
University of Maryland

James Jankay
Consolidated Edison, Inc.

Lupe Jimenez
Sacramento Municipal Utility District

Briana Kane
Cape Light Compact

James Kimmel
ideas42

Constantine Kontokosta
NYU Center for Urban Science and Progress

Ruirui Kuang
ideas42

Kiran Lakkaraju
Sandia Laboratory

Lisa LeGault
Clarkson University

Mark Lorentzen
TRC

James Mannarino
NYSERDA

Kevin Manz
NY State Public Service Commission

Paul Markowitz
Efficiency Vermont

Susan Mazur-Stommen
American Council for an Energy Efficient Economy

Catherine McPherson
American Academy of Arts and Sciences

Evan Michelson
Alfred P. Sloan Foundation

Laura Moody
Albany Housing Authority

Ryan Moore
NYSERDA

Edy Moulton
Columbia Business School

Susan Moyer
NYSERDA

Jessica Nolan
Action Research

Richard Ottinger
Pace University

Carlene M. Pacholczak
NY State Public Service Commission

Marcos Pelenur
Behavioural Insights Team

Brian Peter
NYSERDA

Jane S. Peters
Research into Action

Judith Polgar
American Academy of Arts and Sciences

Steven Puller
Texas A&M

Varun Rai
University of Texas at Austin

John Randell
American Academy of Arts and Sciences

Andrew Revkin
Pace University

John Rhodes
NYSERDA

Philip Rubin
White House Office of Science and Technology Policy

Gonzalo Sanchez
Texas A&M

Maxine L. Savitz
National Academy of Engineering; Honeywell, Inc. (ret.)

Linda Schuck
California Institute of Energy and Environment

Wesley Schultz
California State University, San Marcos; Action Research

Jennifer Senick
Rutgers University

Amanda Sherman
Clarkson University

Lisa Skumatz
Skumatz Economic Research Associates

Scott Smith
NYSERDA

Jeremy Snyder
Rensselaer Polytechnic Institute

Paul Stern
National Research Council

Janet Swim
Pennsylvania State University

Jennifer Tabanico
Action Research

Annika Todd
Lawrence Berkeley National Laboratory

Tsvetan Tsvetanov
Yale University

Elaine Ulrich
U.S. Department of Energy

Kim van der Heide
NYSERDA

Edward Vine
Lawrence Berkeley National Laboratory; California Institute for Energy and Environment

Virginia Walsh
Honeywell, Inc.; EmPower

Marsha Walton
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Elke Weber
Columbia University

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John Williams
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