

**Poster Presenter: Heather Akin, University of Wisconsin-Madison**

**Poster Title: Understanding Global Perceptions of Climate Change: A Cross-Cultural Comparison**

**Poster Abstract Text**

Understanding how public perceptions of climate change differ across cultures and regions is critical for understanding how to promote environmentally beneficial behaviors and enact effective climate policies. Most research to date has focused on the climate change beliefs and behaviors of citizens within particular nations, and while such research has provided useful information for national and regional climate policy makers, it has been difficult to assess what causes cross-national differences in attitudes towards climate change. Further, research has shown that publics do not form perceptions of problems like climate change in a uniform way, which may be one contributing factor to the gridlock that characterizes much of the international climate policy discourse. Individuals have been found to form perceptions of environmental risks like climate change using internal, individualized, and subjective strategies, using individual values and ideological heuristics that are acquired through cultural experiences and the priorities of the society in which individuals live. The location and economic context of some countries may make them more or less vulnerable to problems caused by a warming climate, yet little research has explored how individual and contextual characteristics, working in tandem, may cause differences in environmental beliefs and behaviors. To achieve more representative dialogue and environmentally just and effective outcomes, the international community must better understand how beliefs and values differ across cultures and understand local responses to the issue of climate change. One means to understand these disparities is to compare, across cultures, the individual, contextual, and cultural factors that contribute to individuals' perceptions and concern about climate change. To begin to assess what factors might contribute to different views about climate change, this paper uses multilevel modeling and analyzes cross-national data collected in 32 nations to examine what individual and contextual characteristics contribute to different views about climate change. Using individual-level data from the 2010 International Social Survey Project (ISSP) Module on the Environment, collected from a total of 45,199 respondents, this research analyzes how individuals' demographic characteristics, values, perceived environmental norms, and environmental beliefs account for differences in level of concern about climate change. In addition, this study incorporates country-level data, specifically related to each nation's climate policies (obtained from the U.S. Energy Information Administration), environmental performance index, national wealth (obtained from the World Bank's World Development Indicators), and media characteristics, to see how these national-level variables account for differences in individuals' climate change concern. Results indicate that characteristics of nations, particularly national wealth and environmental performance factors, and individuals' values significantly influence citizens' concern about climate change. Implications of these findings for forming effective international and regional climate change policies are discussed.

**Poster Presenter: Ingo Bensch, Energy Center of Wisconsin**

**Poster Title: Behavioral Opportunities Among the Households that Use the Most Energy**

**Poster Abstract Text**

Existing programs and past analyses have shown us that energy savings opportunities are greatest among households with high energy consumption. However, we don't know much about what distinguishes these households. What causes them to be "high users"? What specifically are the behavioral and technical opportunities to save energy in their homes? How can they be best engaged by targeted efforts that promote energy efficiency? In a study of 100 single-family homes with high energy usage, the Energy Center of Wisconsin—in partnership with the State of Minnesota and four partner utilities—is seeking answers to these questions. Through the summer, we will conduct in-home audits and interviews of Minnesotan households whose electricity or natural gas consumption places them in the top 20% of usage. Our goal is to characterize and understand high-using households so energy efficiency programs can more effectively address and serve their particular circumstances. To this aim, we will identify what end-uses and household practices make these homes high users, what savings opportunities exist, and what might motivate efforts by the household to take steps to reduce their usage. We anticipate that we will find high users to be not a single monolithic group, but a few distinct customer segments with different circumstances, needs, and interests. Our analysis will seek to understand and identify these subgroups. Field work for this project will be completed in September, so the results will be "hot off the presses" by the time of the BECC conference. At BECC, we propose to focus on the behavioral components of what we have learned. We will highlight behaviorally oriented savings opportunities we found, address the degree of interest or resistance we encountered from the households about those opportunities, and share the insights we obtained about high users' interests and motivations to take action that reduces their energy usage.

**Poster Presenter: Audrey Bona, IMS**

**Poster Title: Study of occupant behaviors at home and development of a decision tool to improve their interaction with the buildings**

**Poster Abstract Text**

This paper presents the results of an experiment conducted that aim at bringing natural and easiest, the interaction between the occupants of a green building and the building itself. The true challenge is to create buildings that can be understood and used in an optimal way without adding new constraints and reducing comfort of the user (Leaman et al., 2007). We've based our work on the concept of affordance (Gibson, 1979) as a way of adapting the building to their occupant's behaviour. The difficulties encountered by the professionals of the construction are emphasized and the different solutions that are implemented to reduce the gap between the expected and the effective performance are discussed. The results of the proposed experiment shows that simple behavioral patterns should be taken into account to adapt the different systems of the house. This experiment allowed us to highlight strategies and automatic behaviour that are inconsistent with the systems added to green buildings. This data was used to validate a model of affordance which will be the heart of a decision tool for the architects, builders or supervisors. By using this tool, which will be presented at the end of the paper, professional will be able to assess the level of compatibility between the users and the building and have some possible solutions to increase it.

**Poster Presenter: Julie Colehour, C+C**

**Poster Title: Changing Behavior with ENERGY STAR**

**Poster Abstract Text**

The ENERGY STAR label is one of the most widely recognized and trusted labels in the marketplace today. Originally introduced in 1992, today more than 80% of U.S. households across the country recognize the label. A 2013 national study found that 64% of households in the United States associated the brand with “efficiency or energy savings” and 41% of all households reported purchasing an ENERGY STAR-labeled product in the past year. Among its many activities, ENERGY STAR provides third-party certification programs for products, along with certifications for new homes, commercial buildings, and industrial plants. Across the country, ENERGY STAR has become the leading source for credible information about energy efficiency. ENERGY STAR has had tremendous success in achieving brand awareness and educating the public about energy efficiency, but it has only recently dedicated itself to promoting energy efficient behaviors. In 2012, ENERGY STAR partnered with Duke Energy and Efficiency Vermont to conduct pilot programs aimed at encouraging residents to purchase and install ENERGY STAR certified LED lighting in their homes. The campaigns used Community-Based Social Marketing as a framework for developing, implementing, and evaluating the pilot programs. The intent was to develop turn-key strategies that could be used by ENERGY STAR partners across the country. The Duke Energy campaign focused on retail communications, and the Efficiency Vermont campaign focused on school-based communications and an LED fundraising campaign. This poster summarizes the ENERGY STAR program and highlights the ways in which behavior intersects with education and marketing. The poster illustrates the savings that can be achieved through technology, and the critical moderating role of behavior. Energy efficiency is more than just purchasing an efficient technology or appliance. Even the most efficient technology can be used inefficiently, and there is a growing body of evidence suggesting that individuals typically don’t achieve the estimated savings for efficient products. The poster then summarizes the key findings from the two CBSM pilots, and offers an ENERGY STAR “tool-kit” for organizations interested in implementing similar campaigns. Tool-kit materials are summarized, including graphics, messages, and campaign strategies.

**Poster Presenter: Ryan Daley, National Renewable Energy Lab**

**Poster Title: Refueling Behavior of Flex Fuel Vehicle Drivers in the Federal Fleet**

**Poster Abstract Text**

Federal fleets are a frequent subject of legislative and executive efforts to lead a national transition to alternative fuels and advanced vehicle technologies. Section 701 of EPAct 2005 requires that all dual-fueled Alternative Fuel Vehicles (AFVs) in the federal fleet be operated on alternative fuel 100% of the time when they have access to it. However, most drivers do not choose alternative fuel even when it is available. In Fiscal Year (FY) 2012, drivers of federal flex fuel vehicles (FFVs) leased through the General Services Administration (GSA) refueled with E85 24% of the time when available—falling well short of the mandate. Given that federal fleet vehicle drivers do not use their own money to pay for fuel, this behavior is difficult to explain on economic grounds—as is commonplace in the scant research on refueling behavior. Identifying the motivation behind this behavior is critical to understanding how to encourage and increase alternative fuel use in the federal fleet and beyond. The U.S. Department of Energy's (DOE's) National Renewable Energy Laboratory (NREL) completed a 2-year Laboratory Directed Research and Development (LDRD) project to identify the factors that influence refueling behavior of federal FFV drivers. The project began with two primary hypotheses. First, information scarcity increases the tendency to miss opportunities to purchase E85 and many drivers (a) do not know that they are driving an FFV or how/where to find E85, (b) perceive the availability of E85 to be less convenient than it actually is, and (c) perceive that they fuel with E85 more often than they actually do. Second, even with perfect information, there are limits to how far drivers will go out of their way to purchase E85. A range of factors, including (but not limited to) habit, convenience, job performance, and attitudes toward E85 and the mandate to use it, determine these limits. This paper discusses the results of the LDRD project, which included a June 2012 survey of federal fleet drivers and an empirical analysis of actual refueling behavior from FY 2009 to 2012. Access to empirical data for AFV refueling behavior is rare, and this project is unique because NREL maintains a database that tracks all fuel purchases for federal agencies that voluntarily participate in the Fleet Sustainability Dashboard (FleetDASH) project funded by DOE's Federal Energy Management Program (FEMP). Refueling transactions by federal FFVs are cross-referenced with the DOE Alternative Fueling Station Locator to determine whether a driver had access to E85. When these drivers purchase gasoline the transactions are flagged as "missed opportunities". This refueling data provides a common empirical dataset across all federal agencies, which allows for a robust comparative analysis and nationwide living laboratory to study the deployment of alternative fuels and advanced vehicle technologies. This research will aid in the design and implementation of intervention programs aimed at increasing alternative fuel use and reducing petroleum consumption.

**Poster Presenter: Michael Denevan, Community Energy Services Corporation**

**Poster Title: Energy Efficiency and Solar: Reaching the Interested but Uninformed**

**Poster Abstract Text**

For gung-ho, early adopter homeowners, they do not need someone to convince them to “go solar” or to provide encouragement to implement energy efficiency measures. Similarly, the cautious but informed homeowner will determine their own path toward energy efficiency and renewable energy based off personally gathered knowledge and determine when the timing is right. However, there is a large group left, the “interested but uninformed.” For both energy efficiency and renewable energy a wealth of information is available through online websites, through utility-funded programs providing education and incentives, and through contractors looking to sell projects. However for the many homeowners still on the sidelines, preferring to dip their toes before joining in, a strategy to engage them is needed. The available information, without direction can be at best overwhelming and at worst misleading and time consuming for the average homeowner. Utility and government funded incentive programs are effective at reducing installation costs but, without direction, the application process, eligibility, and availability can be daunting for a homeowner. Contractors and financing companies can provide homeowners with the necessary directions but not always with the homeowners’ interests at heart. The “interested but uninformed” homeowner needs an independent navigator to guide them step by step into the energy efficiency and solar waters. In 2009, Community Energy Services Corporation (CESC), a non-profit organization, developed the SmartSolar Program in partnership with the City of Berkeley and DOE’s Solar American Cities Initiative. Currently, SmartSolar serves Alameda and Contra Costa Counties and is funded by the East Bay Energy Watch Program in partnership with Pacific Gas & Electric (PG&E). SmartSolar’s goal is to offer homeowners the necessary navigation and support through free, personalized solar assessments which include efficiency recommendations, roof top analysis, a financial estimate with examples of financing options, and a list of approved licensed solar and home performance contractors. For each assessment, SmartSolar encourages homeowners to “reduce before you produce” by consulting on potential ways to become more energy efficient prior to installing a solar system. After delving into energy efficiency, the homeowners are provided with a solar system estimate based on personal energy history, observed roof assessment metrics (ie. space, tilt, orientation), and possible future changes in energy usage. The report finishes with and upfront cost estimate and typical solar financing options. As part of the assessment package, the customer is provided with a list of approved licensed contractors, and encouraged to solicit three bids. SmartSolar’s partners with local municipalities to encourage the adoption of solar as part of their Climate Action Plans. With more programs like SmartSolar around the United States, more homeowners can feel comfortable making the leap. The water is warm! This presentation will show the results of the SmartSolar Program over the past five years, and how independent advising, from beginning to end, has proven effective at helping guide homeowners towards both energy efficiency and renewable energy and how the program model can be replicated.

**Poster Presenter: Dana D'Souza, Skumatz Economic Research Associates**

**Poster Title: Plastic / Single Use Bag Policy – Bans, Fees, Both, Neither– How do we modify behavior?**

**Poster Abstract Text**

Communities, counties, and states are considering taxes, fees, or ban policies addressing single-use bags – either plastic and/or paper versions. We address 1) the design and policy options around the programs to try to modify behavior, and 2) the behavioral reactions to the programs. The rationales for policy (ban, fee, taxes) to address single use bags generally mention eliminating litter, protecting the local environment / wildlife, conserving resources and the global environment, and funding education (and litter clean-up) programs. Tonnages are not large, and direct avoided disposal costs are tiny. However, arguments for addressing these products with some kind of policy relate to the disconnect between the “duty cycle” of the bag (largely used once, and for an hour or less) vs. the resulting lifetime in the environment, the cost of damage (to environment and wildlife) and clean-up, and the ready availability of (reusable) substitutes. There are two main elements of policy design / choice around the single-use bag issue:

- ban or fee (advance disposal fee, sometimes viewed as a “tax”),
- whether both single-use paper and plastic are treated similarly, and
- how to design to best drive behavior change.

Our research into these programs has found that these issues have been treated differently in different jurisdictions (with a focus on North America). The presentation provides detailed information on:

- Summary assessments of pros and cons of these policy alternatives (ban vs. fee vs. no action; paper and/or plastic) and the rationale for behavior change;
- Where single-use bag policies are in place;
- Rationales used for the implementation of policy;
- How they work; where the money goes;
- Impacts and lessons.

Most importantly, we examine the results in terms of behavior change in reaction to these programs (fees and bans), and the results of surveys and impact studies related to customer behavior and acceptance. Whether the policy is ultimately suitable in a particular community is for the decision-makers / elected officials; the pros and cons and suitability issues are examined in this presentation.

**Poster Presenter: Rebecca Ford, Victoria University of Wellington**

**Poster Title: Energy Transitions and the Energy Cultures Framework**

**Poster Abstract Text**

The energy system in New Zealand, which is fundamental to our daily activities and income generation, is undergoing significant change in the near term. This transition and its impacts must be properly understood to ensure that New Zealanders continue to have access to reliable, safe and affordable energy, and this presentation discusses elements of a 6-year multi-institution research program designed to provide insight into both future changes and those already underway. With a government target of 90% renewable electricity supply by 2025, the increase in renewables in the system in the next 12 years, which is likely to come from wind, will result in increased temporal variability of power generation. Alongside this, the lowering prices of PV means that NZ is starting to see its rapid uptake by households, despite the lack of feed-in tariffs. These changes will require a more active demand side participation in power management if the electricity grid is to remain safe and function efficiently and economically. New Zealand's electricity grid and its regulation were developed in an age where uni-directional flows were the norm, and the likely changes resulting from increased supply variability, micro-generation, new appliances (including EVs) and demand management bring a set of new challenges and opportunities. Demand response, for long the poor cousin of supply, is starting to pick up especially amongst industry, but it has significant potential amongst households due to the proliferation of home energy management systems on the market. New Zealand's vehicle fleet is completely dependent on imported fossil fuels, but electric vehicles are a good choice given the high renewable proportion of NZ's electricity supply. We are starting to see niche adoption of these new technologies, which suggests that we may see the emergence of a new 'energy culture' in NZ that is aligned to New Zealanders' interest in energy independence. However, this transition from one set of energy-related behaviours to another is a highly complex process, and we utilise an interdisciplinary approach to help provide greater insights to change. Our interdisciplinary approach is supported by the use of the Energy Cultures framework, which states that energy behaviour is the outcome of interactions between people's expectations about energy services, the technologies they use, and the practices they undertake. These are in turn influenced by factors beyond their control such as policy settings, energy prices and social marketing. Achieving behaviour change can be immensely difficult because of the tendency of these influences to support the status quo, and because of the heterogeneity in circumstances of energy users. The Energy Cultures framework has proved to be surprisingly fruitful, and this presentation focuses on its use as a tool to help understand the transitions currently underway in the New Zealand energy system. We use it to evaluate the uptake of new and disruptive energy technologies in the residential sector, including photovoltaic micro generation and electric vehicles, as well as the impact of these technologies on subsequent energy related behaviour. We also discuss its use in identifying demand response opportunities from a household, technological, and system perspective.



**Poster Presenter: Karoline Gamma, University of St.Gallen, Switzerland**

**Poster Title: Customer Acceptance of Energy Consumption Feedback Systems: The Role of Hypocrisy Under Different Construal Levels**

**Poster Abstract Text**

Smart grid technologies offer consumers real-time feedback of their energy consumption (Appelrath et al., 2012; Clastres, 2011; Daoud & Fernando 2011; Kranz et al., 2010; Faruqui et al., 2009). Several studies investigate the effectiveness of feedback in regard to consumers' energy usage behavior (Stromback et al., 2011; Cometta et al., 2010; Faruqui et al., 2009; Abrahamse et al., 2005; Geller, 2002; Kantola et al., 1984). However, these studies do not address the issue of customer acceptance of energy consumption feedback systems. Only when consumers accept such systems through adopting and integrating them into their daily routines they might react to the feedback provided on it. Following the idea of "moral satisficing" (Gigerenzer, 2010) as an effective but accurate cognitive process, we investigate how the construal mindset moderates the effect of induced hypocrisy on customer acceptance of energy consumption feedback systems. Both – the theory of hypocrisy (a special form of cognitive dissonance) and the theory of construal level mindset – have successfully been applied in the context of conservation behavior (White et al., 2011; Rabinovich et al., 2009; Aitken et al., 1994; Dickerson et al., 1992; Kantola et al., 1984). However, their joint effect has not been investigated so far. Thus, this paper aims at answering the following research question: Does the construal mindset moderate the effect of hypocrisy on customer acceptance of energy consumption feedback systems? Several studies have demonstrated that hypocrisy leads to behavioral change in the field of conservation (Aitken et al., 1994; Dickerson et al., 1992; Kantola et al., 1984) or health behavior (Stone et al., 1994; Aronson et al., 1991). However, it is unclear how a person's mindset, like the construal level (Trope & Liberman, 2000; 2003; Trope et al., 2007), influences the effect of hypocrisy on behavioral change. Following a joint view on both research streams we predict that the effect of hypocrisy on behavioral change (increase in adoption and usage of energy consumption feedback systems) is higher when people are in a high-level construal mindset than when they are in low-level construal mindset. The following hypothesis summarizes this previously made conceptual derivation. Hypothesis: The positive effect of induced hypocrisy on adoption and usage of energy consumption feedback systems will be higher under a high-level construal mindset than under a low-level construal mindset. To test the proposed model we draw on laboratory and field experiments. Exploratory experiments have already been conducted. Data collection for study 1 is ongoing with currently approx. 40 participants (Master students in their roles as energy consumers). Study 2 is scheduled being conducted ahead of the conference, so that the results of both studies will be presented at the conference. In particular we intend to identify conditions under which inducing hypocrisy can be leveraged to increase acceptance of energy feedback systems. The paper wraps up presenting implications for practice and theory.

**Poster Presenter: Thomas Glendening, ICF International**

**Poster Title: Smart Thinking – Leveraging Technology to Foster Behavior Change**

**Poster Abstract Text**

The HVAC industry is evolving at a rapid pace and thermostat technology has game changing potential. Smart Thermostats offer energy users an easy platform to control the comfort of their homes and the operation of their heating and cooling equipment from almost anywhere. Utility companies benefit from the ability to engage customers in demand response (DR) events, which reduces peak load and the need for additional power plants. ICF International, in conjunction with Consumers Energy, has launched a Smart Thermostat pilot program, exploring features of leading devices and benefits to the customer and utility. Energy consumption tracking for the homes of participating customers provides quantitative data on behavioral changes, providing an understanding of how mobile technology influences a consumer's interaction with their thermostat and the impact of Smart Thermostat reporting on lifestyle changes. Program specific DR events and participation data provide insight into customers' opinions of DR events prior to and following the occurrence, as well as a better understanding of how DR influences customer behavior and energy use. Standard energy efficiency programs and the greater marketplace can use the knowledge gained to better market DR initiatives, incentivize Smart Thermostats, meet energy savings goals, and incorporate Smart Meter programs.

**Poster Presenter: Chris Gordon, Vermont Energy Investment Corp.**

**Poster Title: Go Vermont: Advancing Commuting Alternatives & Innovative Partnerships**

**Poster Abstract Text**

How do we move the dial forward in a rural state to get commuters out of single occupancy vehicles and into carpools and vanpools, on buses, walking and riding bikes? The Go Vermont program is a statewide effort that assists Vermont commuters and their employers in finding environmentally friendly and cost-effective point-to-point transportation opportunities. The State of Vermont's Agency of Transportation, Vermont Energy Investment Corporation (VEIC), and regional transportation partners are engaging business customers and their employees to decrease the economic and environmental cost of commuting. Building on personalized business seminars and surveys that assess baseline and the desired future state for a business's support of transportation offerings, Go Vermont offers carpool matching services, cost-sharing of van pools, and a Guaranteed Ride Home program to ensure employees taking advantage of these options can get home if an emergency arises. In addition to making a workplace more transportation friendly, participation in the Go Vermont program improves Vermont's efficiency portfolio and helps the state meet the goals of its Comprehensive Energy Plan which include "supporting alternatives to single occupancy vehicle use." This presentation will cover the partnership framework of Go Vermont and its impact on changing commuting behavior in Vermont. A specific focus will be VEIC's strategy to advance behavior change through existing relationships with the state's 300 largest energy users. In partnership with Go Vermont, VEIC staff charged with providing energy consultation to businesses have broadened their customer discussions from focusing on the energy use of the building to include transportation efficiency and its benefits to both employer and employee. We will discuss the effectiveness of leveraging these energy efficiency conversations as a springboard for guiding a company toward more comprehensive transportation efficiency offerings. The benefits of partnering with local transportation service providers and Transportation Management Associations to engage businesses and employees in more in-depth, customized transportation strategies will be highlighted. [www.connectingcommuters.org](http://www.connectingcommuters.org)

**Poster Presenter: Paul Grimal, University College London**

**Poster Title: Reframing Energy Demand Reduction in the UK residential sector: Implications of 24 Hours Profile Energy Performances for Policy-makers and Utilities**

**Poster Abstract Text**

Carbon emissions and energy demand reduction targets for the UK residential sector pose considerable challenges for the implementation of energy policy. The need to rapidly up-scale energy retrofit programs suggests that policy measures may need re-examination beyond current schemes to engage householders and utility companies. For energy suppliers, the scale and scope of energy demand reductions have important implications for their long-term business model and strategies. Utility companies need to accommodate the deployment of energy retrofit programs for the residential sector with their broader objective of re-positioning business models as the UK moves to decarbonize electricity generation and to the full development of a smart grid. However, current approaches to the analysis of potential savings in the residential sector that rely on annualized energy demand data may under-estimate the potential benefits of extensive energy-retrofit interventions for some parts of the residential sector. This study aims to reframe conventional approaches that use annual energy savings to determine the scale and scope of retrofit measures, whereby the small predicted annual energy savings from some dwellings poses a barrier to their implementation. Instead the study examines changes in 24-hour profiles to evaluate potential energy savings from retrofitted dwellings in terms of the decline in their peak demand. This forms the basis of an economic analysis, particularly from an electricity utility perspective, to explore the potential ways that retrofits programs relate to business options that allow utility companies to gain market share in the transition to a smart energy grid. The analysis uses a simple metric based on the Princeton Scorekeeping Method (PRISM) as a way of ranking of dwellings according to quintiles energy performance. It draws on both 30-minute and daily gas and electricity meter readings from more than 500 dwellings together with average daily temperatures to determine a weather-adjusted index of consumption. The 24-hour profiles are based on 30-minute data, are then used to inform analyses return on investment for a variety of energy performance interventions that shift different categories of dwellings (based on size, type, and age) to the best energy performance quintile. An examination of the results suggests that, for some dwellings that are not recognised as worthwhile under an annualised energy demand analysis, this analysis indicates that there are incentives to intervene. Those interventions include reducing peak load gas consumption for dwelling whose energy performance is low and engaging in the full electrification of heat for those dwellings whose energy performance is average. Furthermore after retrofit, the lower demand profile of certain sub-groups of the residential sector results in their being amenable to further advanced low-carbon technologies, such as heat pumps or energy management and storage systems, that enables them to fully engaged in the smart grid. These findings suggest that, in contrast with conventional analysis, energy retrofit is likely to be a worthwhile intervention for utility companies in a wider range of dwellings in the residential sector. More broadly, the analysis illustrates the importance of research translation for taking a detailed perspective.

**Poster Presenter: Rimas Gulbinas, Virginia Tech**

**Poster Title: Quantifying and Targeting Inefficient Energy-Use Behavior in Commercial Buildings**

**Poster Abstract Text**

Most existing behavior-based energy efficiency programs are limited in their ability to objectively identify the most energy inefficient building occupants. These limitations prevent the design of more impactful resource conservation campaigns that target specific groups of inefficient energy consumers and also create a confounded incentive system where consistently efficient resource consumers are overlooked. Drawing inspiration from utility-scale customer segmentation research initiatives, we present a newly developed metric that serves as a quantitative proxy measure of an individual's energy efficiency, based on their energy-use load profile during workdays, non-workdays, work hours, and non-work hours. The metric enables the design of more effective, targeted energy conservation campaigns and improved assessments of spatial efficiency (energy/occupancy). The novel adaptation and expansion of clustering algorithms to effectively classify, segment, and target building occupants as well as physical spaces (based on various sensor data streams) can also improve the accuracy of many energy-use prediction algorithms. We present the methodology behind the construction of the metric as well as results that demonstrate how energy-use predictions can be improved by first filtering energy user by their entropy.

**Poster Presenter: Caroline Hodge, Columbia University**

**Poster Title: Translating Behavioral Research for Policymakers and the Public**

**Poster Abstract Text**

**Poster Presenter: Farzana Hannan, Wayne State University**

**Poster Title: Creating Transparency in the Energy/Emissions Link through LEEM (Locational Emissions Estimation Methodology)**

**Poster Abstract Text**

**Poster Presenter: John Horn, California Center for Sustainable Energy**

**Poster Title: Utilizing Green Button Data to Ascertain the Economic Benefit of Switching to Time of Use Rates for PG&E, SCE, and SDG&E EV Customers**

**Poster Abstract Text**

As California's plug-in electric vehicle (PEV) market expands beyond early adopters to the wider new car purchasing population, there has been a shift in customer motivation from environmental considerations towards a greater focus on fueling cost savings. This change signifies a positive development in the market and represents a shift towards broader market appeal for PEVs. However, purchasing an electric vehicle facilitates, but does not ensure reaching fuel cost savings; to maximize the value of the purchase customers must also choose the optimal utility rate structure, which requires an understanding of both vehicle usage and their residential load. This requirement presents a complex challenge for many customers and could act to hinder widespread adoption. Alternatively, customers could adopt then charge their vehicles with suboptimal rate structures resulting in higher fueling costs than a comparable conventional vehicle. In many cases, time of use (TOU) rate structures offer homeowners the greatest value for charging their PEVs, by providing variable pricing based on windows of time throughout the day. Currently, when a consumer purchases a PEV they must contact their utility and elect to switch to an EV TOU rate structure. These customers do not, however, receive any personalized estimates of which rate structure is optimal or the potential impacts to their underlying residential load. If customers are unaware of these rates or choose not to elect one, they will remain on their existing plan, which in the case of most customers in California is a volumetric block pricing tariff with escalating pricing based on amount rather than time of use. In the case of consumers with large existing usage, this type of plan is extremely detrimental to a PEV's value in delivering fuel cost savings. To characterize the impact of rate selection among existing PEV drivers in California, we analyzed Green Button data from participants in the Clean Vehicle Rebate Project (CVRP), collected through the PEV Owner Survey. Green Button is a standard that allows customers from utilities across the country to download their 15 minute to hourly energy interval usage for their home in a consistent file format. Using this data, along with customer specifics such as the make and model of their PEV, climate zone, and heating source, we were able to calculate the cost impact of rate selection for each participant, both in terms of fuel cost savings as well as changes to the cost of underlying home energy usage. Our findings show that the vast majority of customers in California's three major investor-owned utilities (SDG&E, PG&E, and SCE) would benefit greatly by switching from their default domestic rate structure to a TOU option. The benefits of making this switch can be as large as 56% for vehicle fueling costs and 38% for building usage. Conveying this information to new PEV owners is critical to supporting the continued expansion of the electric vehicle market.



**Poster Presenter: Evan Johnson, University of North Carolina at Chapel Hill**

**Poster Title: Are Heavy Energy Users More Likely to "Buy In" to Residential Energy-Saving Programs and Services?**

**Poster Abstract Text**

The increasing urgency of environmental damages associated with energy use, along with the restructuring of the electricity industry have spurred interest and controversy in determining the most effective policies for encouraging demand for renewable energy and energy efficiency services. Utilities are increasingly seeking to provide green power supply options in order to remain competitive in a more customer-driven market. In addition to renewable power options, many utilities also offer demand-side management (DSM) programs such as load control and time-of-use pricing, providing financial incentives for consumer participation in energy efficiency and conservation efforts. A limited empirical literature on the effects of these programs, and voluntary carbon offsets more generally, has revealed evidence for "moral licensing," or the use of good behaviors to justify "bad" (Jacobsen et al. 2012). While extant scholarship contains numerous attempts to explain participation and outcomes of utility-sponsored voluntary programs for renewable energy use and energy efficiency, few have examined both types of programs simultaneously, and even fewer have included other electric utility services such as energy audits and time-of-use agreements as outcomes alongside VEPs. The present analysis examines six different energy-saving programs and services to determine whether participation is more likely among heavy consumers of energy who are possibly seeking to relieve a sense of guilt about their comparatively large environmental footprints. It employs residential electricity billing data linked to detailed behavioral and demographic measures. Preliminary results suggest that voluntary participation in green energy programs is decreasing, albeit slightly, in electricity consumption, a result that challenges findings in existing literature. Older customers appear more likely to participate in all types of programs. Appliance-specific offerings seem to be most heavily influenced by greater electricity consumption levels.

**Poster Presenter: V. Rory Jones, PlanetEcosystems**

**Poster Title: Today's Customer Engagement Initiatives: Missing the Point?**

**Poster Abstract Text**

This presentation will look at the state of customer engagement and upping the game substantially with the use of powerful new consumer appeals. Utility service providers seem to be approaching customer engagement from the wrong angle – meeting policy objectives, rather than delivering customer value. Using techniques borrowed from other consumer markets, and with smart grid, performance measurement, big data, and custom/personalized information, an entirely new set of utility sector-specific consumer value propositions are now being used to better engage and motivate. Beyond achieving heightened efficiency program performance, these new value props play a substantive role in defending against competing providers (such as retail providers and new entrants such as CCAs and telcos) and substitutes (such as solar and forthcoming technologies like storage and fuel cells). This presentation will explore:

- What utilities can learn from other industries and increasingly think about customer loyalty, rather than just satisfaction
- How utilities must break from the past and focus on what consumers really value (break/fix advice, achieving substantial bill savings, help with purchase decisions, etc.)
- Specifically, what value props are most appealing, and how they need to be presented

Always-on is no longer enough; it's time for utility service providers to step it up – ahead of market changes – and to avoid the mistakes many telcos made in losing customers when they saw alternatives coming; consumers are increasingly getting options, and what matters now is loyalty.

**Poster Presenter: Aaiysha Khursheed, Itron**

**Poster Title: Lights Out! T12s Have Left the Building**

**Poster Abstract Text**

Due to the enactment of the Energy Policy Act of 2005 (EPAAct 2005), many types of T12 linear fluorescent lamps were phased out of production beginning on July 1, 2012. Manufacturers of linear fluorescent lamps are prohibited from T12 production, though sales of existing T12s are allowed to continue until inventories are depleted. This policy change has led several utilities, including Pacific Gas & Electric Company, Xcel Energy, and Southern California Edison, to stop providing rebates for T12 lighting system retrofits. Based on observations from non-residential lighting contractor and vendor telephone surveys and telephone surveys of downstream non-residential lighting program participants conducted in 2013 in California, the message to move away from T12 lighting systems has come through loud and clear. These surveys were conducted in support of the 2010-2012 California Public Utilities Commission's Commercial Market Share Tracking Study and the Non-Residential Downstream Lighting Impact Evaluation. Vendors and contractors who are knowledgeable about the phase out were asked if they inform their California non-residential customers about the policy and over 80 percent reported that they do let them know about the T12 phase out. The surveyed contractors and vendors were also asked if they have noticed that their customers are choosing to retrofit their lighting systems earlier than they expected because of the T12 phase out policy. More than 60 percent reported that their customers do this change in customer behavior is specifically due to the T12 phase out policy. Non-residential lighting customers were also surveyed to examine how the T12 phase out has affected their decisions regarding lighting system replacements and maintenance. Facility managers and building operators of non-residential sites were asked if they are aware of the T12 phase out. Those who are knowledgeable about the policy were asked if they chose to retrofit their lighting systems because of the policy's effect on the availability of T12s. Timing of retrofits was also addressed with customers to see if the T12 phase out policy motivated them to retrofit T12 lighting systems earlier because the availability of T12s would be affected by the phase out. The phase out of T12s represents a national change in federal lighting standards. Even before the phase out went into effect, retrofitting T12s to T8s represented a leading contributor to many utility energy efficiency programs. The phase out has affected the amount of savings that can be claimed for T12 to T8 change out since soon T12s will be obsolete. Commercial lighting energy efficiency programs and the types of measures for which they offer rebates are currently being updated in accordance with the new federal lighting standards. Better understanding of how the phase out is affecting recommendations by contractors and decision making by building managers is crucial to designing effective commercial lighting programs going forward.

**Poster Presenter: Lauren Knapp, University of Delaware**

**Poster Title: Offshore Wind Power: Perceptions, Preferences and Willingness to Pay**

**Poster Abstract Text**

Offshore wind power is poised to play a significant role in the future of global climate change mitigation and transformative U.S. energy policy in the coming decades. Yet, social, policy and economic barriers continue to impede its implementation. The US Department of the Interior has designated a 124 square mile area adjacent to the Delmarva Peninsula, termed the Maryland Wind Energy Area (WEA), with plans to lease this land for utility-scale offshore wind power development. With these efforts are expected to come divided opinions in Delaware and Maryland across state and local levels related to economic, environmental, and other impacts. This research uses a mixed mail and internet survey. It will shed light on the social dimensions of development in the Maryland WEA among Delaware and Maryland residents. Emphasis is placed on coastal residents because they are more likely to be affected by the construction and operation of an offshore wind project given changes to the landscape and the potential for conflict between the new use—offshore wind power development—and existing recreational activities and livelihoods derived from ocean-based activities. Specifically, this presentation will overview initial findings on 1) individual perceptions regarding offshore wind development's various effects (pro and con), 2) values, knowledge and belief underlying support/opposition, and 3) individual price sensitivity to electricity rate impacts using a choice experiment.

**Poster Presenter: Megan McMichael, UCL Energy Institute**

**Poster Title: Trusted information on energy efficiency in a community programme**

**Poster Abstract Text**

This paper investigates the role that trusted information has in the establishment of an energy efficiency programme amongst those in a low-income community. Identifying people or organisations that are trusted by householders, and utilizing those resources to further engage and encourage households, will be critical for a programme's success. There is research to suggest that people may find information from mass media resources, but that they will use input from personal resources (e.g. friends, family) before acting on such information. Understanding where people turn to for information can help programme developers target awareness-raising and engage with individuals in a community in ways that are both more intuitive for the householders and more effective for the programme. However, there is also research that suggests that general trust levels may be lower amongst low-income householders living in urban areas in the UK. Low-income householders, and particularly those living in inefficient buildings, have a greater risk of being in fuel poverty, which is very broadly defined as those who spend a disproportional amount of income on household energy costs. The potential limited trusted information or personal resources available amongst the urban fuel poor presents a challenge to community energy efficiency programmes. Tower Hamlets, an area of inner-London, England, is the focus of a unique intervention programme funded through the UK energy regulator, Ofgem. The programme aims to explore the possibilities of energy saving (through installation of smart meters and other behavioural interventions) and energy shifting (through the introduction of a time-of-use tariff) amongst urban households in fuel poverty. Tower Hamlets has a high population density, is ethnically diverse, and will most likely be a 'community of communities' rather than having one overall community identity. The programme's energy savings and energy shifting trials will be staggered over 3 years. The research design is experimental (a randomized control trial), with a control and intervention group, though all householders will receive the same measures by the end of the programme. As the programme is over a lengthy time period, and a high retention rate will help to ensure results robust enough for policy recommendations, it is essential to help householders understand and have confidence in the project. In order to identify trusted sources of energy efficiency and general information, the following methods are employed: stakeholder mapping and analysis of focus group and household survey data. The survey data is based on previous research on social capital which indicates that seeking information from known people is associated with the adoption of energy efficiency innovations. Using the data collected in the early phase, it will be possible to utilise identified intermediaries and gain trust. The results will not only help establish the programme, but will be instructive as a method for developing future community energy efficiency programmes.

**Poster Presenter: Ayako Mikami, Tokyo Gas Co., Ltd.**

**Poster Title: Effect on Energy Saving Behavior by the Incentive in the Smart Apartment in Japan**

**Poster Abstract Text**

【Purpose】 After 3.11 East Japan great earthquake disaster, people's focus shifted towards energy saving and distributed energy systems. Especially sharing heat and electricity in the whole town, these smart networks become more important. In Japan the new houses are already sold as Zero Energy Houses. However, half of the properties are apartments. So we, Tokyo Gas aim to promote the realization of Zero Energy Apartments and verify the possibility of sharing heat and electricity in the town from April, 2012. We achieved approximately 30% reduction of primary energy usage compared with a traditional apartment as we expected. We understood individual behavior could have so many variables and be far from our expectations. And we also found that some elements effected on energy usage such as the room temperature preferences, plug loads, living schedules. In this research, we aimed to find how feasible a peak-cut and peak-shift would be the possibility of sharing energy usage with residences' energy saving behavior changes. We set two incentives up last summer and winter. One is for understanding the point system effect and the other is to understand the alerts effect by CEMS, City Energy management System. This allows us to observe residents behavior.

【Method】 We had two experiments from July to August, 2013. Experiment 1: The point system effect Targets: 22 residents Term: 1st July to 29th July, 2103, and 9th August, 2013 to 28th February, 2014. Incentive 1: The point for the next day's reservation of off-peak time to use electricity and heat. Incentive 2: The point for usage of off-peak time to use electricity and heat on real time. Experiment 2: The alerts effect Targets: 22 residents, Term: 30th July to 9th August, 3times. According to the alert form CEMS on the tablet; we checked how do they encourage their behavior? 【Result】 Regarding the experiment 1, we understood that Incentive 1 worked better and encourage residents more than Incentive 2. The residents preferred the information for tomorrow more than the real-time. If they had the information before, they could make a plan and manage their schedule. At the beginning, we expected that a family with an infant spent a lot of time at home, so that they would attend this incentive program. But their schedule wasn't regular duo to an infant, so we knew it was difficult to join to this program for them. Regarding the experiment 2, we reduced more than 50% of purchasing electricity with our effort by controlling the building equipments such as FC and storage battery. And we found that 50% of residents checked the alert on a tablet and 40% of them took some actions. And we also got an opinion that the alert should be announced with some energy saving actions. In this research, we got a lot of useful data and opinions. Now we are accumulate data and analyzing them. So we are looking forward to sharing this result at the BECC 2014.

**Poster Presenter: Ken-ichiro Nishio, Central Research Institute of Electric Power Industry**

**Poster Title: Electricity-saving Behaviors in the Residential Sector of Japan**

**Poster Abstract Text**

In Japan, there have been continued shortages of electric power particularly in the summer months, after the Great East Japan Earthquake and the nuclear power plant accidents. In the summer of 2011, electricity saving with a target of 15% was carried out in the service areas of Tokyo Electric Power Company. In the summer of 2012, efforts were made to save the electricity throughout Japan, particularly with a 10% target in the Kansai Electric Power Company's service area. In the summer of 2013, there were no numerical targets, while voluntary actions were recommended. This study aims to examine changes from 2011 to 2013 in terms of the electricity conservation rate, implementation rates of measures to save electricity, and awareness of electricity conservation. We conduct a follow-up questionnaire survey of about 1500 households in Tokyo and Kansai area who participated in our previous surveys, and group interviews of 20 people. Eliminating the effects of weather, the electricity consumption during July-September 2013 was lower by an average of 10% than the 2010 level in each region. The implementation rate was lower than the level of the previous years. Normative motivation and informational motivation became weaker, while economic motivation was stronger partly stimulated by the electricity rate increases. The reduction by behavior changes became fairly small, whereas there was a continuing effect of switching to energy-efficient products, and thus it is estimated that the same level of reduction continued.

**Poster Presenter: Nicole O'Connor, Energy Outreach Colorado**

**Poster Title: Occupant Engagement Considerations: Nonprofit Staff vs. Affordable Housing Resident Strategies**

**Poster Abstract Text**

Are you working to engage your residents, your coworkers, your staff, or anyone in changing behaviors in order to save energy? These audiences have many similarities but also differing motives in changing behaviors. Energy Outreach Colorado (EOC) is a private, nonprofit that provides energy efficiency upgrades within low-income nonprofits and multi-family buildings. In conjunction with energy efficiency, EOC implements an Energy Behavior Change Program in order to maximize energy savings by engaging and motivating building occupants in energy saving behaviors. While there are clearly defined and similar steps to the process EOC implements with nonprofits and affordable housing facilities, there are distinct differences in the individual approaches taken with nonprofit staff in comparison to affordable housing residents. Each step of the process is customized in order to meet and address specific community needs. The more customized occupant engagement is to each individual facility, the more successful the outcomes associated. While a clear process exists to the entire program, strategies exist in order to engage all building staff and/or residents' different perspectives. This presentation highlights the practiced process in EOC's Behavior Change Program along with highlights of the differentiations that exist when working within an office setting in comparison with a low-income residential setting. Some practices and these differences may help you implement your own occupant engagement programs along with learn considerations that should be taken when addressing a residential occupants vs. staff occupants.



**Poster Presenter: Meghan Oswalt, USDA Forest Service**

**Poster Title: US Forest Service's Power-IT-Down Initiative**

**Poster Abstract Text**

In December 2013, the US Forest Service launched National Power-IT-Down (PID), a collaborative effort between Sustainable Operations (SusOps) and the Chief Information Office (CIO) focused on regular power down of computers and IT peripherals. This nationwide effort builds on a voluntary, 1-year pilot in Region 5 (California), which saved \$3,560 and 31,660 kWh. The Region 5 pilot demonstrated the cost-savings potential of PID, revealed the internal partner network needed, and highlighted obstacles to overcome in order to scale up the PID effort nationally. With 43,000 computers in use throughout the Forest Service, PID has the potential to save the Agency \$2.5 million annually as well as significant CO<sub>2</sub> emissions from reduced electricity consumption. During the first 3 months of National PID, 27 Units reported saving 78,092 kWh and \$6,031. This is equivalent to annual greenhouse gas emissions from 11.5 passenger vehicles. Savings from PID will increase as more Forest Service Units begin participating regularly. The diagnostic framework for National PID stems from a "Roles, Rules, and Tools" workshop led by Lawrence Berkeley Laboratory (LBL) at the 2012 BECC Conference. Specifically, we identified that a joint-leadership model (SusOps and CIO) would be the most effective approach to harness the behavioral change capacity of SusOps as well as the technical knowledge of CIO. Two groups were formally convened via official correspondence from the Chief Information Officer – a PID Core Team and PID Steering Committee. A PID Communication Cadre, comprised of both SusOps and CIO employees, was also formed to provide outreach support. Additionally, National PID was endorsed by the Forest Service National Leadership Council. By engaging this cross-Staff Area network plus leadership, we built the capacity, backing, and expertise to effectively launch PID. Since launching National PID, we have applied LBL's four Elements of Implementation – Educate, Engage, Enable, and Evaluate. Our PID Communication Cadre has prepared formal correspondence distributed by the Deputy Chief of Business Operations, informal emails sent directly to PID Points of Contact, flyers to post in participating offices, and national webinars. Also, we created two online reporting formats (meter and non-meter) to best accommodate all end users and provided repeated briefings to ensure alignment. Finally, we recently awarded a contract with Tripos Software (another connection made at BECC 2012) to create an online learning module specific to Green IT/PID. These efforts to educate and engage employees at all organizational levels also enabled employees to take ownership of PID at their local facility. Evaluation, which is accomplished by compiling bi-weekly reports on kWh and cost-savings submitted by PID Points of Contact, is a key component of PID. Results Briefings are shared regularly, and results are posted monthly on our National PID SharePoint Site. We also capture success stories and post them on our SharePoint Site to showcase those who have gone above and beyond or have demonstrated a unique method to engage employees at their local Unit. In summary, National PID combines the principles of leadership, information & feedback, social empowerment, and continuous change & innovation to increase workplace sustainability.

## Agency, capacity and electricity demand reduction

Yael Parag (PhD)

The 'middle out' (MO) framework (developed by Parag and Janda) suggests that two essential elements for successfully reducing energy consumption are *agency* and *capacity*. The term 'agency' refers to actors' abilities to make their own energy reduction choices, and 'capacity' refers to actors' abilities to perform the choices they made. Both agency and capacity are influenced by sets of social, economic, cultural, technological and political variables. A change is more likely to happen when people are interested in change and levels of agency and capacity are high. A challenge for demand reduction is how to, and who could increase agency and capacity.

Figure 1: agency, capacity and likelihood of change

Capacity	High	Not interested in change but capable of performing it – change is unlikely	Interested in change and capable of performing it - change is likely
	Low	Not interested in change and incapable of performing change - change is unlikely	Interested in change but incapable of performing it – change is unlikely
		Low	High
		Agency	

The MO framework suggests that the ability to improve levels of agency and capacity often lies with middle actors, who are neither suppliers nor consumers, but, rather, those who influence various aspects of energy practices and patterns of consumption.

The findings reported here (1) provide empirical support for the relations between agency, capacity and demand reduction, and (2) identify middle actors and their impact on consumers' agency and capacity.

Findings are based on a study in a rural community in Israel of ~210 households, in which the community pays its members electricity bills.

**Method:**

- (1) A questionnaire measured levels of agency and capacity, collected demographic data, and identified middle actors.
- (2) Actual household electricity consumption was measured in 2012 and in the same period of 2013.

**Findings:**

Dependent variable: differences between household electricity consumption in 2012 and 2013 (in %).

- (1) Agency, capacity and electricity consumption: Significant differences were found between levels of agency and capacity and change in electricity consumption between 2012 and 2013:

		N	Mean (% change)	Std	Median	Sig
<b>Agency</b>	<b>Low</b>	15	+2.19	14.36	1.99	0.0343
	<b>High</b>	35	-7.23	13.28	-7.97	
<b>Capacity</b>	<b>Low</b>	17	+3.55	11.93	3.39	0.0039
	<b>high</b>	33	-8.50	13.59	-8.54	

(2) The combination of agency and capacity: Significant differences found between 3 independent groups:

	<b>N</b>	<b>Mean (% change)</b>	<b>Std</b>	<b>Median</b>	<b>Sig</b>
<b>Low</b> levels of both agency and capacity	9	+6.67	12.82	5.02	0.0092
<b>high</b> levels of both agency and capacity	27	-9.39	13.41	-10.15	
<b>Mismatch</b> between levels of agency and capacity	14	-1.91	12.31	1.32	

- (3) Mismatch: no significant differences in electricity consumption were found between the groups with (a) low capacity and high agency, and (b) high capacity and low agency.
- (4) No significant differences were found between the number of people in a household or size of house and (a) low / high levels of agency, (b) low / high levels of capacity, and (c) the combinations of agency and capacity.
- (5) No significant correlation was found between % of change in consumption and (a) number of people in household, or (b) size of house.
- (6) Middle actors: The community energy officer and the local electrician were identified in the questionnaire as influential middle actors on households' energy-related actions (capacity). The electricity bills and written information provided by the local electrician were identified as influential information sources on energy-related decision making (agency).

**Poster Presenter: Nirav Patel, Human Dimensions Research Unit, Cornell University**

**Poster Title: High School Educators and Their Students' Perception of Climate Change and Renewable Energy**

**Poster Abstract Text**

Concerns over global climate change, environmental degradation, and dwindling nonrenewable energy resources have prompted the need for an effective Renewable Energy Education (REE). The study evaluates attitudes of educators and their students towards Renewable Energy Systems (RES) across five states (DE, MD, NY, OH and PA). It specifically examines information and attitude-based factors that affect REE. The purpose of the current study was to determine whether the students of teachers trained in REE were more likely to pursue renewable energy education, compared to students of teachers who had not attended similar workshops. A survey tool was administered to two groups of students: 1) students of trained teachers, 2) students of untrained teachers. Preliminary results indicate that while workshop attendance influenced educator attitudes, such effects were not passed down to students. However, the students did show an increased interest in renewable energy education, if educators formalized it within their course(s) or if required it as a wider part of the curricula and standardized testing measures. However, compared to other issues (e.g., hunger and poverty), students were less aware of issues related to renewable energy and climate change. The perception is that climate change is distant, and not an immediate concern, such as poverty and hunger. This suggests a dissonance that can only be addressed through an interdisciplinary curricula adoption of renewable energy.

**Poster Presenter: Stefanie Rumm, Hochschule Weihenstephan-Triesdorf, Straubing Centre of Science**

**Poster Title: Labelling of Bio-based Plastics**

**Poster Abstract Text**

With the increasing importance of climate protection and conservation of fossil fuels agricultural raw materials become more and more interesting for the production of plastics. Various products especially for food packaging based on renewable resources are yet available. But consumers do not easily recognize these products due to lack of knowledge about their existence and because there is no label in Germany to distinguish them from fossil-fuel based plastics. A label would be one possibility to inform consumers quickly and comfortably because plastics made from renewable raw materials are a credence good. Consumers have to trust the information given on the product. Although there are 400 existing labels for food and fast-moving consumer goods in Germany from a consumer point of view labels nevertheless play an important role: They reduce uncertainty about product and process quality at the point of sale and help consumers in their buying decisions. An online consumer survey will be conducted in Germany in April 2014 using choice-based conjoint analysis focusing on the following research questions: Does a label for bio-based plastics generally make sense? How important is a label in the purchase decision compared to other product attributes like price, resource base and share of renewable raw materials? Our target group are German citizens between ages 18 and 65 who are responsible for household shopping. Sample size will be 1,200 participants. In this survey consumers will be confronted with different label options and information about bio-plastics. This research will examine how consumers perceive, assess and evaluate information. Therefore the Heuristic-Systematic Model (HSM) seems appropriate. The HSM aims to explain how people receive and process persuasive messages. A recipient of a persuasive message about an object has to weigh how much time and cognitive effort is necessary to form a realistic opinion about the object in question. We prime participants with different information treatments. We convey different impressions about source credibility (high vs. low) and relevance for consumers (high vs. low). Generally, we expect differences between the participants which were primed with different information. Concerning the sense of a label for bio-based plastics participants with a positive attitude towards renewable resources and high environmental and climate awareness are likely to consider a label for identification more useful than participants with a negative attitude. It is likely that price will be important but we expect also the existence of a label as relevant.

**Poster Presenter: Nic Sawe, Stanford University**

**Poster Title: The Impacts of the Energy Star on Consumer Decision-Making**

**Poster Abstract Text**

The Energy Star certification program highlights energy efficient goods with a logo. Since appliances are also labeled with price and both relative and absolute energy consumption information, economic theory suggests that certification should not alter consumers' choices. Nonetheless, recent research shows that certification does indeed influence appliance choice by increasing the average efficiency of purchased appliances. However, there appears to be considerable heterogeneity in consumers' responses to the Energy Star logo, motivating two questions. First, what do these differences imply about the value of the Energy Star for consumers, given that it could either focus attention on energy consumption data or act as a substitute for this information? Second, do particular individual characteristics prompt systematically different responses toward Energy Star certification? We investigate these questions using a stated choice experiment. A nationally-representative sample of 1,550 homeowners responded to 10 light bulb choice sets with exogenous variation in Energy Star labels on the alternatives. Each participant also responded to over 140 questions beyond the stated choice tasks, and the answers provide a richer demographic, financial, and psychological characterization of appliance consumers than available to prior researchers. We make a structural assumption that choices reflect an underlying random utility model, and a mixed logit approach allows us to estimate individual-level utility parameters. Our analysis suggests that the Energy Star certification program on light bulbs delivers lower value to consumers than a hypothetical tax that scales with the alternative's power rating. The intuition behind this result is that the Energy Star sometimes increases (decreases) an individual's sensitivity to energy consumption, even if they are overly (inadequately) sensitive to energy consumption, absent the Energy Star. These impacts appear to outweigh the program's ability to increase (decrease) other individuals' inadequate (overly high) sensitivity to energy consumption, absent the Energy Star. While the hypothetical tax also yields these heterogeneous impacts, the tax is a continuous instrument that can be set so as to optimally balance them. In contrast, the Energy Star is a blunt instrument, and striking a better balance among the heterogeneous impacts may require a fundamental change to the logo. We also find that the Energy Star's impact differs among individuals with either high numeracy or high environmental concern. Those with high numeracy are more likely to undervalue savings on energy consumption, absent the Energy Star. The Energy Star generally increases these individuals' valuation of savings on energy consumption, thereby increasing consumer welfare. In contrast, consumers with high environmental concern are more likely to overvalue savings on energy consumption, absent the Energy Star. However the label's presence tends to further increase these individuals' valuation of savings on energy consumption, thereby decreasing consumer welfare. The predictable nature of heterogeneity implies a need to consider (1) the distribution of individual-level characteristics and (2) the incidence of the program on persons with these characteristics in policy evaluations. To further investigate these questions, we may also provide pilot neuroimaging data using fMRI to examine the neural underpinnings of consumer purchasing decisions in the Energy Star label's presence.

**Poster Presenter: Rachel Gita Schiff, DNV GL**

**Poster Title: Oh, Behave! Encouraging Energy Efficient Behavior in Small to Medium Commercial Businesses**

**Poster Abstract Text**

Behavior change has recently garnered increased interest in the energy efficiency field as traditional programs reach saturation. At this time, few energy behavior programs exist and most are in the residential market. Commercial buildings however have the fastest rate of growth of energy use in the US and consume roughly 20% of total energy (Bin, ACEEE 2012). Small and medium commercial businesses make up a large percentage of total use. The barriers for energy savings in this segment are significant: low participant interest and lack of free time, low awareness of behavioral impacts and small savings from individual behaviors. DNV GL researched programs within and outside the energy efficiency field to identify program concepts that could be adapted to the market as a whole, combining social science theories with energy efficiency expertise. Our goal was to identify universal mechanisms that could be tailored to specific market segment needs of small family owned groceries, chain restaurants and office buildings. Another unique benefit of this program is the “stacking” of different motivational appeals, (Mazur-Stommen, Farley, ACEEE 2013) including cognition, calculus, and social interaction. This program was developed to integrate seamlessly with the long-standing Direct Install programs to maximize on existing framework. This presentation will address lessons learned, strengths, and limitations of current design.

**Poster Presenter: Vince Schueler, Washington State University Energy Program**

**Poster Title: Seeing the Forest and the Trees: Organizational Ecology and Energy Efficiency Program Outcomes**

**Poster Abstract Text**

Over the past five years, fifteen community-based energy efficiency program models using a variety of incentive, program and partnership approaches were tried in Washington State through Washington's Community Energy Efficiency Program and US DOE's Better Building Neighborhood Program. Each program involved a diverse mix of partners including community-based organizations, businesses, community action agencies, local governments, and utilities, each of which brought differing values, objectives, capacity, and experience to the delivery of energy efficiency services. In monitoring these projects over five years the WSU Energy Program has observed multiple instances of projects with similar incentive and program delivery strategies reporting very different production rates, ramp-up rates, costs, and cost effectiveness outcomes. In-depth case studies suggest key drivers of divergent project outcomes are the types of organizations in the governance structure and underlying organizational ecology of the partnership model. The governance model shapes which outcomes are maximized and the organizational ecology. In turn, the organizational ecology -- the types, configurations, capacity and relationships of the organizations in service delivery model -- shapes how coherently, effectively and efficiently incentives and services are deployed and coordinated. We will illustrate this phenomenon by applying a combination of case study analysis, systems analysis, and organizational mapping tools to seven Northwest whole-house upgrade programs with similar delivery models but diverse results. • Community Power Works (Seattle, WA) • Community Energy Challenge (Whatcom, Skagit and Island Counties) • Sustainable Living Center (South East Washington) • Sustainable Works (State Wide) • Repower Kitsap (Kitsap County) • Energy Trust of Oregon – Home Performance Track (State Wide) • Clean Energy Works Oregon - Home Performance Track (State Wide) The paper will map partner attributes in the governance structure to choices for program goals, program partners, and contractor networks. We will illustrate how the resulting organization ecology can shape the timing and clarity of decisions and actions, the need for and costs of coordination, and the coherence and efficiency of service delivery and execution. Finally we explore how these intermediate outcomes influence final upgrade outcomes and prospects for long-term viability and market transformation. We will use this exploration to make the case that the systematic analysis of the governance structure and organizational ecology that undergirds most energy efficiency programs provides crucial and often overlooked insights into explaining energy efficiency program performance outcomes. We will conclude with a review of energy program evaluation literature (ACEEE, IEPEC, AESP) to summarize how the behavior of organizations and systems of organizations have or have not been analyzed and addressed in the past. This will include a discussion of "best practices" and relevance of findings from community-based programs are relevant to utility-sponsored programs, and recommendations for future research to strengthen theoretical models and refine analytical tools. Third and Fourth Authors: Loren Lutzenhiser, Portland State University Rick Kunkle Washington State University Energy Program



**Poster Presenter: Meng Shen, University of Maryland and Tianjin University**

**Poster Title: Opinion Dynamics Model for Social Norms on Behavior Based Energy Efficiency**

**Poster Abstract Text**

Behavior based energy efficiency has emerged as a critical and highly cost-effective solution to energy saving by changing people's behavior and opinion. Early studies showed that changed behaviors lead to approximately \$2.2 billion per year in the US residential sector alone. By providing residents with their energy use and making normative comparison with peers, more than 2% of energy reduction can be achieved. With a great potential to energy conservation, however, it remains unknown whether behavior-based energy savings persist in a long term and whether normative feedback causes undesired boomerang effect. This paper aims to model and understand the dynamics of residents' energy conservation under social norm context in order to achieve sustainable behaviors for energy efficiency. We use Deffuant model to integrate social norm into energy efficient behaviors. Based on uncertainty analysis and information transmission mode, we are able to explain and simulate how residents adjust their own opinions and behaviors, or and what the processes and results are when people are touched by social norms or other's energy efficient behaviors. The model simulates the reality in three aspects. First, the model indicates that regarding home energy saving opinion, the interactions between residents create order (consensus or agreement) out of an initial disordered situation (fragmentation or disagreement) through communicating with others and learning from social norms. Drawn from the social science literature, this effect is often termed "social influence". Second, with the consideration of that the opinions of different people update asynchronously, we try to modify Deffuant model to make it more close to the realistic situation. This is due to the fact that generally residents can adjust their own opinion as a response to the external information, however, they can not make sure other person involved would change their mind proportionately at the same time. Third, the model exposes that there is one or more characteristic values in the domain of energy consumption norms which have significant influence on everyone. In this paper, we test and demonstrate: 1) whether the personality of residents make significant influence on the acceptance of the norms when it comes to energy efficient behaviors, and what strategies available to optimize the influence; 2) Can we increase the persistence of energy saving by providing multiple energy consumption standards instead of single standard; and 3) whether changing characteristics of communities will lead to favorable and sustainable energy conservation movement. The simulation and analysis is based on an experiment conducted the Joint Base Andrews in Maryland. Detailed discussions are presented in the paper.

**Poster Presenter: Ellen Steiner, EMI Consulting**

**Poster Title: A Research Methods Taxonomy for Behavior Based Programs**

**Poster Abstract Text**

On December 19, 2013, ACEEE released the Field Guide to Utility-Run Behavior Programs. This research is described by author Susan Mazur-Stommen as “the first comparative analysis of programs that focus on changing customer behavior to save energy.” Through this analysis, Mazur-Stommen and Farley constructed a taxonomy of programs, “each of them grounded in the behavior and cognitive sciences and representing a unique way of affecting consumer behavior.” The value of this taxonomy according to Mazur-Stommen is the ability to “compare the success of various strategies in changing behavior, as well as their cost effectiveness, and how much energy use they save.” Using this groundbreaking research as a foundation, this paper develops a companion taxonomy of the research methods applicable at all stages of a program maturity lifecycle model including conceptualization, development, implementation, execution and retirement for the categories of behavior programs identified in ACEEE’s Field Guide. Drawing on methodologies used in marketing, business, organizational development, evaluation, psychology, sociology and anthropology, this companion taxonomy enables program designers, implementers and evaluators to not only be able to descriptively compare these programs on behavior change, cost effectiveness and energy savings but also understand the formative and summative research methods that are most effective for identifying critical insights into the leading and lagging indicators of these success criteria at all stages of program maturity. The presentation of this paper will share the Research Methods Taxonomy for Behavior Based Programs with session attendees, providing an overview of the research methods, their benefits and drawbacks, examples of research questions that can be addressed, and key sources for additional information. As the most accessible measures are captured (sometimes referred to as low hanging fruit), additional savings become more expensive as program designs increase in complexity to deliver deeper savings or broaden customer participation. Given this trend, it is crucial that programs maximize energy savings through any means possible, including capitalizing the human side of the equation of more traditional widget-based DSM programs as well as more innovative behavior-based DSM program. This Research Methods Taxonomy for Behavior Based Programs is designed to be accessible by multiple audiences and is designed to help program designers, implementers, and evaluators systematically consider the possibilities that exist to drive valuable insights. This taxonomy addresses not just the more common methods traditionally utilized in energy efficiency but also addresses less common research methodologies such as user research, A/B Testing, ethnographic studies, supply chain analysis, content analysis, grounded theory, eye-tracking research, positioning research, predictive panel research, etc.

**Poster Presenter: Carol Suhan, FortisBC**

**Poster Title: Kooteany and Okanagan Energy Diets**

**Poster Abstract Text**

**Kootenay and Okanagan Energy Diets Program Description:** Based on the success of the Rossland Energy Diet pilot project (BECC poster presentation in 2012), the Kootenay and Okanagan Energy Diets were launched in May and August 2013. The campaign was offered to FortisBC natural gas electricity customers in the South, Central area of British Columbia (approx. 165,000 residential customers). The primary goal of the program was to overcome homeowner barriers to making energy efficiency improvements to their homes. The benefits to participants were the on-going reduction of energy costs and increased comfort in their homes (temperature, drafts, noise reduction). Greenhouse gases would also be reduced. Goals: The expanded Energy Diet program was designed to address homeowner barriers to making energy efficiency improvements to their homes, and included the following key components:

- An intensive information and marketing campaign to encourage homeowners to make energy efficiency improvements to their homes (i.e., heating system, building insulation, weatherization and window and door improvements). Social marketing theories and tactics were used to encourage participation:
  - o theories of scarcity and reciprocity
  - o building community norms
  - o partnerships and community leader support (formal and informal support from city councils and staff)
  - o informal support from community groups, trades organizations, contractors and retailers
  - o personal contact and commitments
  - o energy ambassadors to promote the program and provide residents personalized service and information
  - o personal commitments
- reduced-cost home energy assessments
  - o through a bid process and bulk purchasing arrangement
  - o local government financial support
- access to the LiveSmart BC and FortisBC rebate programs (up to \$4,000 per home);
- access to low-interest, long-amortization financing through local credit unions

**Objectives:**

- To have 5 percent of single-family homes in the area (2,000) complete pre-upgrade energy assessments; and
- To have 75 percent of participants make improvements to their homes and access the rebates and/or low interest financing.

**Results:**

- 4.5% of homes, or 1835 homeowners, completed pre-upgrade home energy assessments. (The Kootenay and Okanagan Energy Diets represented 47% of the pre-upgrade assessments completed in British Columbia in the 2013/14 year.)
- 13 municipalities and 2 Regional Districts provided formal support for the program, and all of which provided funding to reduce the costs of the pre-upgrade home energy assessments and helped to promote the Diets.
- The program created a buzz. Neighbours encouraged neighbours and slowly the culture of energy efficiency upgrades and knowledge is being grown. The data on the number of homeowners that made improvements to their homes and accessed rebates is incomplete. Residents had until March 31, 2014 to submit energy assessment results and rebate applications. FortisBC expects to receive the final results from Natural Resource Canada by mid-summer, at which time a formal evaluation will begin. Anecdotally, the participation results and overall participant satisfaction are very strong.

**Poster Presenter: Signe Waechter, ETH Zurich**

**Poster Title: The Misleading Effect of Energy Efficiency Information**

**Poster Abstract Text**

For more than 10 years, the European Union (EU) energy label has informed consumers at the point of sale about the energy efficiency and electricity consumption of various electric goods. The label is mandatory for various products, such as televisions, freezers, and washing machines, and the vendor is obligated to place the label on the corresponding product. Considering the large amount of energy needed for entertainment electronics and household appliances, consumers' purchase decisions are crucial for the development of the future energy demand. Thus, the aim of the EU energy label is to enable consumers to purchase an energy friendly product, more precisely, a product with low energy consumption. Little is known, however, about how this energy label is used and understood by consumers. The results of a set of experimental online studies conducted with a random sample of the Swiss population revealed that this policy intervention might actually provoke a boomerang effect. Findings suggest that, in a single evaluation condition, consumers tend to base their estimates of a product's energy consumption mainly on the energy efficiency class (e.g., A) communicated on the energy label and ignore information about annual electricity consumption (e.g., 120 kWh/year). This means that consumers could potentially overestimate the energy friendliness of a product assigned a high energy efficiency rating. This misleading effect of energy efficiency information is not only found for single evaluations, but the effect also persists for situations that match realistic purchase situations. More precisely, when consumers compare two products in terms of energy friendliness based on all the information provided, they could still be misled by the energy efficiency information, and purchase a less energy friendly product because it has a high energy efficiency rating. Finally, focusing on the energy efficiency class can even lead to underestimating the energy consumption of product categories that generally consume excessive amounts of energy (e.g., freezers). More precisely, consumers incorrectly assume that a high energy efficiency rating (e.g., A++) means that the energy consumption of products typically associated with high consumption is no longer problematic. Thus, the energy label, a policy measure aimed at enhancing sustainable consumption, could in fact have the opposite effect, leading to an increase in overall energy consumption. This presentation will discuss possible explanations for the misleading effect of energy efficiency information and will conclude with an outlook on further research regarding the energy label. Speaker: Signe Waechter

**Poster Presenter: Marsha Walton, NYSERDA**

**Poster Title: NYSERDA's Behavior Research Model**

**Poster Abstract Text**

Abstract: Behavioral strategies applied in the right way to the right problem may be able to strengthen clean energy program uptake and generate more comprehensive program savings, but they need to be designed and evaluated fastidiously to provide statistically reliable information to clean energy program decision makers and regulators. This presentation will describe an innovative model that NYSERDA developed to test behavioral interventions at the pilot level with confidence that the information generated will be robust and useful for clean energy program design and deployment. It will provide a brief synopsis of the decisions that created NYSERDA's Behavior Research Program and its current model that (1) funds researchers to conduct behavior pilots in New York State, (2) contracts with independent expert advisors to review key deliverables, and (3) validates the effects of behavioral strategies using experimental design. NYSERDA's Behavior Research model is the first of its kind in the country and it provides a model that other organizations can adopt. Time allowing, the presentation will include mention of a new NYSERDA program, the Behavior Demonstration Program, which builds upon successful behavior pilots conducted by NYSERDA and others.

**Poster Presenter: Cindy Ward, Wilfrid Laurier University**

**Poster Title: Motivation for Small and Medium Enterprises to Reduce Energy**

**Poster Abstract Text**

There is increasing interest in how to effectively engage people in behavioral changes that are necessary to reduce energy use. There has been a focus on interventions that encourage individual households and large corporations to reduce energy, however, there has been very little research investigating the motivational factors that might induce small and medium sized enterprises (SMEs) to engage in energy reduction strategies. This program of research fills in this very important gap. Using a sequential mixed-method design: qualitative interviews (n = 18) and a comprehensive quantitative survey (n = 331), an SME Motivation Model was developed to capture the key motivational factors expected to influence energy reduction motivation for SMEs. Using multiple regression modeling (Study 2), six motivating factors emerged: (1) desire for improved efficiency, (2) existing environmental values, (3) desire to save money on utility bills, (4) perceived social norms, (5) increasing customers via positive reputation, and (6) a desire for less future hassles. The results of the present research provide important evidence in understanding the motivation for small and medium sized enterprises to engage in energy reduction. The motives for reducing energy all seem to point towards an overall desire to make decisions that 'make good businesses sense'. I will discuss the broad theme of SME business decision-making and how future research could elaborate on the SME Motivation Model.

**Poster Presenter: Amy K. Wolfe, Oak Ridge National Laboratory**

**Poster Title: Behavioral and Building Performance: Strategies for Institutional Change**

**Poster Abstract Text**

The people who use federal buildings—employees, operations and maintenance staff, and the general public—significantly impact a building’s environmental performance and the consumption of energy, water, and materials. While many strategies have been used to introduce new occupant use behaviors that promote sustainability and reduced resource consumption, few have been verified in the scientific literature or have case study results well enough documented to gauge their usefulness in federal agency settings. This presentation first will discuss the need for a systems perspective in analyzing energy use in buildings, then present a construct of rules, roles, and tools to define a baseline context. The presentation then will summarize validated strategies that have been shown to encourage new use behaviors that can result in significant, persistent, and measurable reductions in resource consumption. In doing so, we will provide the evidentiary and conceptual background for selecting proven context- and goal-specific behavioral change strategies, and highlights potential opportunities for federal agencies and the commercial building sector. The final element will be high-level recommendations for implementing an action-based framework for changing individual and organizational use behaviors and achieving organizational sustainability and building performance goals. The systems perspective focuses on how the individual, groups of individuals (e.g., work groups), and institutions use building spaces and structures to fulfill needs for work accomplishment and their own maintenance. We view the building as a locus of behavior and people-building interactions as a system. The objective is to elucidate potential strategies to achieve improved building performance within the context of the organization and its culture—behavior and behavior change aim to enable these outcomes and are not ends in themselves. A key part of this systems perspective is institutional context: rules, roles, and tools. Institutional context frames the strategies and actions that will be effective in driving significant and enduring change. New approaches must use evidence-based principles and apply proven behavioral change strategies that align with the behaviors and cultures at multiple levels within the organization and that are best suited for achieving specific energy- or sustainability-related goals. Initiating change is different from maintaining or improving upon those changes over time. Ensuring sustained change requires an adaptive approach that (1) leverages successes, (2) updates and embeds formal and informal organizational rules to support sustainable resource use, and (3) strategically promotes change in organizational culture driven by leaders and others playing key roles in the organization. In the federal sphere, unless new technologies, occupant use behaviors, and institutional rules and requirements are integrated to complement new stringent federal building performance requirements, suboptimal outcomes will limit agencies’ abilities to achieve their sustainability and building performance goals and objectives.