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Commercial Programs

Moderator: Olivia Patterson, Opinion Dynamics

Author: Amy McLean Salls, Ms, United Illuminating

Paper Title: Behavior Change Strategies To Advance Sustainable Business Practices

Abstract: The Business Sustainability Challenge (BSC) is an innovative Energize Connecticut (EnergizeCT) ratepayer funded initiative. The two investor owned utility companies in CT, United Illuminating and Eversource provide programs to enable their business customers' efforts to lower costs, reduce consumption and waste, and chart a course for a more sustainable future. The initiative provides customers with strategies to develop a strategic carbon and energy management plan as a foundational step and encourages business to set "stretch" goals by applying positive pressure in peer roundtable discussions. The BSC has initially targeted a number of industries for the peer roundtables including wastewater facilities, manufacturing, nursing homes, and colleges and universities. Through the roundtables, businesses share ideas and develop collaborations that help them tackle trickier issues like renewable energy and cost-effective recycling and material recovery. These peer groups are a key part of the strategy to apply social pressure to businesses to achieve higher levels of savings than otherwise thought possible. One of United Illuminating's largest customers, a water utility, has engaged with the BSC for 3 years. What began through waste and recycling evolved into tackling energy and carbon. Now they are in the process of working with the BSC to integrate sustainability and long term energy and carbon management into a conscious corporate culture that seeks to become a net-zero emissions organization, enhance the long-term profitability of the organization, and create a foundation for sustainability and prosperity for the region it serves.

Sustainability at the organization now reaches from daily activities to a long-term organizational strategy. They offer comprehensive recycling for their headquarters and have begun to launch a new food waste pilot along with supporting a non-profit creating a community garden with an adjacent global manufacturing company. Their long term energy and sustainability plan reaches across implementing energy efficiency measures for their buildings and process equipment to installing new distributed generation of renewable energy and mechanisms to support sustainable economic development of business in the communities that they serve.

The BSC is about building a culture of expansive energy efficiency and climate emissions reductions through businesses competitiveness and cooperation. When combined with other energy efficiency offerings, like measuring the energy output or behavioral change through process improvements, it creates a winning long term strategy for businesses that rises to the top and becomes a model for the future.

AMI and Time of Use

Moderator: Debbie Brannan, Navigant

Author: Anthony Duer, Associate, Applied Energy Group

Paper Title: Getting to Know You: Predicting Customer Response to Utility Programs

Abstract: Over the last several years, machine learning and data science have emerged as the next wave of technology promising to revolutionize our understanding of consumers and their behavior. However, despite this relatively nascent emergence, machine learning is actually a mature field of study and encompasses familiar algorithms such as logistic regression in addition to the more recent advancements in neural networks and deep learning. In a recent project for Oklahoma Gas & Electric (OG&E), Applied Energy Group (AEG) undertook a study to predict how well customers would respond to their SmartHours program – specifically, whether customers would be good candidates for enabling technology on a time-differentiated rate. The goal of the project was to help the utility prioritize the distribution of free programmable communicating thermostats (PCTs) to customers that volunteered for the program to those likely to have the highest impacts (or best response) on the rate.

Our study approached this problem using the following steps:

1. Our training dataset was cleansed and sanitized of errors including: finding, and eliminating anomalies, eliminating observations without enough demographic data, adjusting the categorical data to fit within the models, and then normalizing the data.
2. We developed several initial model specifications using a simple logistic regression, without machine learning, to test the validity of our approach.
3. We next used machine learning to take our testing to the next level, exploring different estimation approaches and specifications.
4. We validated our model against the known customers using k-fold cross validation and hyperparameter tuning check the model's confidence – were customers that responded well scored highly? And were middling customers scored mediocre?
5. Finally, we let our chosen model evaluate the unknown customer data to generate scores for each candidate which are currently being used to prioritize the distribution of PCTs but the utility.

In addition, we worked with the utility client to set confidence parameters to avoid misclassification (i.e. to target only customers above a certain threshold) and increase the focus of the marketing campaign. Our paper first discusses the process we used to test and develop the final model including each of the steps that we present above. We will also touch briefly on new features on the horizon that will make this process much easier and even more robust.

In addition, we cover some of the advantages and disadvantages of each model while providing a high-level overview of how each accomplishes its learning task. Perhaps most importantly, we provide insight into what happens when theory reaches reality and how we overcame various problems such as missing survey data, model tuning, and analyzing the resulting customer scores. We then close with a high-level overview of our results and our roadmap for the project going forward.

Author: James Fine, Senior Economist, Environmental Defense Fund

Paper Title: How Consumers make Decisions about Time-of-Use Electricity Pricing Plans

Abstract: California is pursuing essential economy-wide limits on greenhouse gas pollution that will spur increased reliance on renewable energy sources. A key tactic will be timing electricity use with solar and wind generation via time-of-use (TOU) pricing plans and robust consumer marketing and education. This project investigates how consumers make decisions about TOU pricing. Here we present findings from two experiments: (a) the role of decision modes in shaping choices and resultant satisfaction, and (b) how people respond to choice architecture defaults when presented with TOU rate option. Our goal is to elucidate the psychological processes underlying consumer decisions to inform new interventions that might encourage the broad adoption of time-of-use rates, and to influence, in real time, TOU pilots underway in California. We administered online surveys to approximately 1,132 California utility customers that were generally representative of the California population.

In the first study, we found respondents generally prefer the time-of-use plans, choosing them more often than standard plans. They also feel more positive emotion toward a TOU utility plan and anticipate it will result in fewer negative future consequences when compared to a standard utility plan. Additionally, respondents were more likely to choose the TOU plan if they were using a role-based decision mode (i.e., making a decision with their role in society in mind).

In our second study, we find that respondents who are presented with the TOU plan as the default option are more likely to choose the TOU plan. We also find that respondents who are presented with the standard energy plan as the default option display similar choice patterns to those who were not presented with a default choice. Importantly, we also find that setting the TOU plan as the default did not result in greater reactance and negative customer satisfaction. Future experiments will examine how messaging can influence decision mode to increase satisfaction when choosing TOU plans, and how revealing the default choice as the environmentally preferred choice influences both selection of the default and associated satisfaction.

These findings are informing actionable steps in California's large scale piloting of residential TOU pricing plans, an effort that is a crucial example for the rest of the country.

Author: Lee White, University of Southern California

Paper Title: The Effect Of Income And Perceived Control On Household TOU Acceptance

Abstract: Maintaining a reliable electricity supply with increasing shares of intermittent and decentralized renewable generation will require both upgraded infrastructure and greater flexibility within electric grids. Time of Use (TOU) rates are one of the many demand-side response measures that can facilitate this increased flexibility. Although pilot programs have established that households reduce peak electricity demand in response to TOU peak-time rates, it is not yet well understood which factors affect household acceptance of TOU outside pilots, nor whether these factors differ for low-income households. Recent research on potential TOU adopters has found perceptions of control, usefulness, and ease of use predict intentions to adopt TOU plans.

Building on these findings, this paper creates a model of residential customer TOU acceptance, defined as customer intent to stay on TOU rates after taking part in an incentivized pilot. More specifically, we investigate the roles of enabling technologies (e.g., smart thermostats), household income, and perceptions around control and comfort in predicting TOU acceptance. We use a sample of several thousand residential electricity customers who took part in a large utility-sponsored TOU pilot in Southern California. Hourly electricity usage data and bill data will be used to model actual customer bill changes and peak demand times. Survey data on perceived control, household demographics, and smart thermostat ownership will also be used.

We hypothesize that among the factors which affect TOU acceptance will be: (1) customer perceptions of the extent to which TOU rates (a) are easy to understand, (b) facilitate management of electricity bills, and (c) allow control of comfort; and (2) actual customer ability to shift demand to off-peak rates (thus actually facilitating bill management). The impact of perceived ability to manage bills on TOU acceptance is expected to be stronger among low- (vs. higher) income households, and negative perceptions may lead to either financial stress or to high drop-out rates from TOU programs. Finally, perceptions that smart thermostats provide additional control over cost and comfort while on TOU rates are expected to enhance TOU acceptance.

Results will reveal the extent to which TOU acceptance is influenced by perceptions of costs, comfort, technology ownership, and household income. If low-income groups are particularly influenced by perceived control over bill management, there is a strong case for future research to examine which messaging or technological strategies can be developed to focus specifically on increasing perceived ability to manage electricity bills within this group, potentially also increasing actual ability manage electricity bills on TOU. Findings will further inform utility program design and implementation. For instance, if resistance to TOU is based more on perceptions of control than actual achieved management of electricity bills, enhancing customer perceptions of control (e.g., through messaging) could improve TOU acceptance. Findings around smart thermostat ownership may suggest financial incentives for enabling technologies to increase TOU acceptance.

Framing & Segmentation

Moderator: Chris Jones, BECI, UC Berkeley

Author: Erica Iverson, Research Assistant, CRED (Columbia University)

Paper Title: Moral Foundations and Environmental Decisionmaking

Abstract: The current atmosphere of political polarization has had a unique impact in the environmental realm, where climate change "denialism" is now a mainstream political viewpoint. In order to encourage pro-environmental decisions among all Americans, it is imperative that businesses and policymakers develop solutions that move beyond denialist attitudes. We posit that one way to achieve this is to develop a thorough understanding of the moral underpinnings that inform everyday decision making. For example, liberals often consider environmentalism to be a moral imperative; conservatives, by contrast, may not share this moral vision. Moral Foundations Theory (MFT) offers a framework for approaching these conflicting moral viewpoints. MFT argues that the full moral domain comprises five categories, and research has consistently shown that while conservatives accept all five categories, liberals typically accept two of the five (Haidt & Graham, 2007; Graham et al., 2009). Understanding these dimensions of morality will allow policymakers to craft pro-environmental campaigns that can meaningfully influence both conservative and liberal populations.

Emerging research has connected MFT and environmentalism with an eye toward explaining and shifting negative attitudes toward climate change. This research shows that the same moral categories that reflect ideological differences also reflect support for government interventions to combat climate change (Dawson & Tyson, 2012) and self-reported intentions to make pro-environmental decisions (Dickinson et al., 2016). Specifically, harm/care and fairness/justice were positively correlated with both policy support and behavioral intent, while ingroup/loyalty, authority/respect, and purity/sanctity were negatively correlated with policy support and behavioral intent.

This past research explores the moral foundations of environmental motivations for environmentally beneficial behaviors. Yet we know that households take action to reduce energy use for a variety of reasons. Can moral foundations help us understand how households decide to complete neutrally-framed energy efficiency home upgrades? This poster presents the results of a survey that randomly sampled 400 U.S. homeowners about their decision processes for purchasing an energy efficient washer/dryer and weatherizing. The survey assessed participants' perceptions of the barriers and benefits involved and their likelihood of completing each upgrade. Our study does not require a belief in climate change or a stated intention to combat climate change prior to selecting actions that will nonetheless reduce carbon emissions.

We present findings related to two research questions: First, do we see the same pattern of connections between moral foundations and a willingness to undertake pro-environmental actions when those actions are framed neutrally rather than environmentally? Second, how can moral foundations dimensions provide a framework to explain respondents' reported barriers and benefits when considering these behaviors? We expect that respondents' endorsements of environmental benefits will mirror observed patterns between MFT and environmental attitudes, but we do not expect this relationship to extend to likelihood of completion ratings. Lastly, based on respondents' assessments of reported barriers and benefits to these actions, this poster will outline takeaways about how environmental program designers can target individuals using messaging that motivates environmental action across a wider variety of moral beliefs, even in the face of "denialism."

Shaking Up The Norm

Moderator: Ed Smyth, DNV GL

Author: Adriane Wolfe, Principal, Quinn Energy LLC

Paper Title: South Sup: Community Demand Response

Abstract: Demand response (DR) can provide a non-poles and wires alternative to utility system capacity upgrades by reducing peak demand. DR programs have traditionally targeted commercial & industrial clients. However, many utility distribution circuits feed primarily residential loads. Early residential DR programs have been technology focused. A Con Edison pilot of air conditioner (AC) controlled DR achieved 0.3 kW per AC unit controlled [1]. Shifts in behavior can result in competitive residential demand reduction. In a 2016 study, at EcoVillage Ithaca, residents participated in community dinners at a community center. In that study, 0.5 kW electric demand was reduced per household in the evening time per participating household [2]. These savings reflected both reduction of residential cooking and reduction of plug loads, lighting, and HVAC associated with a group of evening time occupancy behavior.

Utilities and regulators are looking for new, innovative business models for distributed energy resources (DER) and are beginning to embrace Community Distributed Generation (DG). Community DR is proposed as a somewhat analogous measure. It can incentivize residential households to work as a community to achieve demand reduction in aggregate. Fundamental to this concept is creating a systematic structure that rewards positive community behavior by providing a beneficial experience as opposed to asking residents to sacrifice. The financial incentives for the DR can go to the community organization that hosts the event, or can be split with participating households.

A Community DR pilot called South Sup was conducted in the Southside Neighborhood in downtown Ithaca, NY. The Southside Neighborhood has a mix of low-to-moderate income and market rate households in a historically black neighborhood. The neighborhood has approximately 1000 residential housing units that are fed by the same electric circuit feeder coming off the South Hill Substation. The community was invited to free dinners at the Southside Community Center. To simulate a demand response signal, they were given notice of 48 hours or less via flyers, social media, and emails.

The primary focus of the study was to explore the logistics of holding Community DR events: to identify opportunities and challenges and to consider scalability. Could dinners be held at the Southside Community Center with just 48-hour notice? What participation rates would be achieved on short notice? Can the meal compete with technology based DR economically? What barriers would limit potential market penetration? The Community DR events held demonstrated a potentially cost-effective DR measure that could be executed without the burden of installing equipment. The meals had multiple benefits in providing social events to build community and healthy meals for families. Energy savings were not the primary motivator for participation. Crucial to success is achieving high participation rates and encouraging participants to stay at the event for a meaningful duration of time. Event activities were explored. In the future, events could be expanded to include entertainment such as movies, discussion, and energy education.

[1] Con Edison, “Report on Program Performance and Cost Effectiveness of Demand Response Programs,” to State of New York DPS. Dec. 2, 2013, pp 45.

[2] A.Q. Wolfe, et al, “A Case Study of the Measured Demand Savings of Community Dinners,” Behavior, Energy, and Climate Change, , Oct. 20-22 2016.

Thermostats!

Moderator: Jennifer Robinson, EPRI

Author: Molly Podolefsky, Navigant Consulting, Inc.

Paper Title: Staying Cool: Understanding Residential Air Conditioning Use Behavior

Abstract: Utility Wi-Fi Thermostat programs are proliferating together with the expansion of vendor offerings for energy-efficiency, seasonal optimization and behavior-based demand response thermostat algorithms to drive energy (kWh) and demand (kW) savings. However, there is limited information about residential air conditioning use behavior. For example, when do households first turn on their air conditioners at the start of the cooling season, and what are the primary divers? What proportion of households operate on a "9 to 5" schedule versus a "fixed" schedule or use a "manual-only" approach to cooling? How do weather and humidity influence air conditioning profiles? This study uses AMI data from 2014 to establish profiles of hourly air conditioning use for approximately 10,000 customers in Worcester, Massachusetts. Detailed non-learning thermostat data are available for a subset of 200 customers, providing insight into how household are adjusting their thermostats and using air conditioning, and what factors influence that behavior. This study examines the role of temperature and humidity, heat build-up, air quality, wind speed, rate class, and demographics (as available). The analytical approach relies on exploratory analysis and data visualization, as well as classic regression analysis.

(1) Exploratory Analysis and Data Visualization. The purpose of these analyses is to understand customer load shapes at a high level and classify them into distinct HVAC segments for further analysis (e.g., high, medium, low users; home vs. away during the day; etc.). Customers will also be characterized by how they use air conditioners throughout the cooling season.

(2) Regression Analyses. These models derive key relationships between weather and other factors, and air conditioning use across the profiles identified in the exploratory analysis. This will be done for all customers with air conditioning; then, for the subset of customers with detailed thermostat data, actual thermostat setting behavior will be added to the models.

Ultimately the goal of this research is to be able to better understand how a variety of factors affect air conditioning profiles enabling utilities to improve their program design and customer messaging of energy efficiency and demand response programs.

Author: Pace Goodman, Clearing up the Unclear Savings of Advanced Thermostats, Navigant

Paper Title: Clearing up the Unclear Savings of Advanced Thermostats

Abstract: In this presentation, the authors will try to bring light to the uncertainty around advanced thermostat energy savings. Advanced thermostats hold much promise to promote energy savings, encourage a wider adoption of residential demand response and act as a stepping stone for the connected home. They're reaching the market fairly quickly, but Navigant Research's 2016 Smart Thermostat report suggests that demand side management programs should do more to promote this technology. However, how can programs invest in this technology when its value is still so uncertain? Early evaluation studies have yielded mixed results and a December 2016 DOE report stated they save between 1 and 15%. Furthermore, their effect on coincident demand has been largely ignored. While participant groups vary, contributing to the variation in savings estimates, part of the current level of uncertainty is also driven by the wide spectrum of methods used to evaluate advanced thermostat programs. Current methods range from site-specific billing analysis methods, to engineering models based on thermostat telemetry data, to billing analysis models that reflect home energy report evaluation approaches. The Uniform Methods Project provides guidelines for evaluating savings from demand side management programs and three of its chapters could apply to advanced thermostats. The problem is, these chapters provide conflicting guidance. Similarly, Energy Star is developing a connected thermostat testing procedure for designating these devices as Energy Star, and this approach provides a fourth option for evaluation. With four conflicting guidelines, it's not surprising to see methods and results vary.

In this presentation the authors will attempt to address the uncertainty around thermostat savings due to real world trends, such as changing participant demographics, as well as the uncertainty due to methodological decisions. More specifically, they will discuss (1) recent results from an evaluation of over 24,000 participants, (2) early 2016 results from a pilot program of over 2,000 participants, (3) results from investigative analysis into the appropriateness of certain methods, (4) a discussion of differences between participants and the general population for characteristics such as pre-existing thermostat type, and (5) a comparison of methodologies across industry evaluations, three applicable Uniform Methods Project chapters, Energy Star testing protocols and academic literature. This presentation will add to the body of knowledge by trying to explain some of the current variation in reported thermostat savings, recommending approaches to standardize results and presenting results that reflect the current academic literature.

Author: Noah Lieb, Associate, Apex Analytics

Paper Title: Squeezing every last drop: A Nest Seasonal Savings Evaluation

Abstract: Nest Labs has recently offered utility customers a new mechanism to derive additional savings from its users: Seasonal Savings. The Nest Seasonal Savings is an opt-in-based setback optimization service that current Nest users can enroll in if a partnering program administrator offers the service. The savings are derived from minor set-point adjustments, and homeowners are unlikely to notice the small, incremental, changes made to their set point temperatures. A Northwest program administrator recently offered a Seasonal Savings pilot to customers and explored the energy savings, customer acceptance and satisfaction, and feasibility of wider deployment of the Nest Seasonal Savings service.

This paper will present the results of the Seasonal Savings pilot evaluation. The primary objectives of the evaluation are to:

- Document the implementation of the pilot, its success, and customer acceptance, including customer opt-in and attrition rates.
- Assess the validity of Nest's internal analysis of energy savings.
- Understand participant behavior regarding thermostat adjustments
- Determine participant satisfaction and comfort of their home.
- Independently evaluate and corroborate energy savings using customer billing data.

To validate the cooling and heating energy savings, the evaluation reviewed and replicated the Nest-originated savings analysis and perform an additional billing analysis for each of the two seasons (summer cooling and winter heating). An additional benefit of this research outside of the validation of energy savings, is to create a process which will allow:

- Linking of Nest usage data with billing and survey data
- Participant release of 15-minute interval electric usage data during the participant survey

This evaluation will provide valuable feedback both for program administrators looking to include an additional low-cost measure and evaluators looking for insight into managing partnerships with Nest and ensuring participant release of usage data.

Using Info And Data To Engage Consumers

Moderator: Sylvia Bender, CEC

Author: Guy Champniss, Enervee

Paper Title: Insights On Effective Nudging Across Decision Styles & Choice Models

Abstract: Engaging consumers in energy efficient behavior is challenging. Despite most consumers consistently claiming to care about energy efficiency, this attitude all too frequently fails to result in action, creating what is often labelled as the attitude behavior gap. This paper reports a series of randomized controlled trials (RCTs) focused on behavioral levers at the disposal of utilities in engaging consumers in more efficient 1-time consumer product purchases. They are 'quasi-field' revealed preference studies, in which participants reveal product preferences in an ecologically valid setting, namely what respondents understood to be a test version of a new consumer comparison and shopping platform for appliances and products for the home, and which they were accessing from outside of a laboratory or obvious test setting. The studies are based on a novel consumer-facing, utility-branded marketplace platform, which has been deployed in the USA and Europe by utilities serving 50 million households as of April 2017. These marketplaces integrate energy efficiency information in two ways. The first is a relative energy efficiency score, on a zero to 100 scale, assigned to each model in a product category, which can function as either a simple heuristic (just aim for the high number) or as a clear product attribute (concrete efficiency measure). As such, our experimental results suggest that the score works across both the "hot", more impulsive, attitude-based (brand) and "cold", more deliberative, attribute-based decision making styles. The same is not true of the second piece of information provided on the marketplace, namely personalized energy bill savings, presented in dollars, for a selected product model, compared to a benchmark new product. This growing body of experimental results suggests that making efficiency visible (with the granular, daily updated energy score, as well as personalized energy savings), and injecting these cues into the modern – increasingly digital – shopping journey, can influence consumers to make more energy efficient purchasing decisions. In our television experiment, consumers chose models that consumed 12% less energy per year when the score was present than when it was absent, without any explicit energy efficiency messaging or incentives. The benefits from a successful intervention at this natural consumer decision point are compelling. By the authors' estimates, nudging 30% of U.S. product purchase decisions across four product categories (refrigerators, dishwashers, dryers, TVs) in a single year towards super-efficient models with Enervee Scores of 90+ would save over 15,100 GWh, more energy than needed to meet the annual residential electricity demand of Los Angeles and Sacramento combined. As this body of research builds, policymakers and leading utilities are increasingly acknowledging the foundational importance for successful market transformation of making efficiency both visible and intuitively simple for consumers – and essential if we are to engage the mass of consumers and drive private investment into the most efficient consumer products.

Author: Thomas Rushby, Dr, University of Southampton

Paper Title: Large Scale Representative Household Samples in Demand Response Trials

Abstract: The uneven temporal distribution of domestic energy demand is a well-known phenomenon that is increasingly troublesome for energy infrastructures and sustainable or low carbon energy systems. People tend to demand energy, and especially electricity, at specific times of the day and they do not necessarily do so when the sun is shining or the wind is blowing. Demand-side management through flexible domestic demand is seen to be pivotal in maintaining future balance between supply and demand (Barton et al., 2013; Drysdale et al., 2015). However, the potential value of demand response as a solution rests on understanding the nature of temporal electricity demand and the range of household responses to potential interventions (Torriti, 2015).

Although a number of trials of interventions have been reported in both the academic (Allcott and Rogers, 2014; Carmichael et al., 2014; Schofield, 2015) and grey literatures (e.g. AECOM, 2011; CER, 2012), to date most studies have used small scale, self-selected or convenience samples to recruit volunteers for intervention trials. As a result of the inherent bias in such samples and the lack of statistical power in even some of the larger trials (Frontier Economics and Sustainability First, 2012), the findings of these studies cannot be robustly generalized to the wider population. This means that we know relatively little about how the wider customer base uses electricity (Newsham and Bowker, 2010), how they would respond to demand response interventions and what the consequences of population-wide roll out of demand response interventions might be for network reinforcement cost-benefit analyses.

In response, this paper describes the implementation of a randomized control trial designed to understand the effects of three different demand response interventions on a large (N > 4000) representative household sample in the south of England. The paper will describe the study design process, including the statistical power analysis underpinning the sample size requirements; the recruitment process; the electricity consumption monitoring equipment installation and the survey-based data collection.

The paper will present brief results of analysis of household electricity consumption which highlight well-known profiles of hourly, daily and seasonal consumption (Craig et al., 2014; Powells et al., 2014) and draw attention to previously un-reported patterns of early evening use at weekends by some household groups. We analyse measured electrical load and self-reported activity (from time-use diaries) to link reported changes in the timing of household practices to observed changes in electricity consumption. The paper will describe the use of this data in the analysis of household response to a range of messaging focussed on different appliances and usage habits over an intervention period of several weeks. The trials culminated in a final 'event day' to simulate network and/or supply constraints and offered a financial incentive to one group if demand was reduced during peak hours. Our paper will conclude with an assessment of the effectiveness of the interventions for reducing evening peak electricity consumption in the south of England and will describe how the results will be used to inform the iterative design of subsequent trials and additional analysis.

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Author: Valerie Richardson, DNV GL

Paper Title: Click Here For Savings? Using Online Tools For Continuous Customer Engagement In Energy Efficiency

Abstract: Utilities are increasingly using web-based tools as a platform for educating and promoting customer engagement with their energy consumption. These tools gather basic information from customers about their homes and habits to provide them with an online "audit" that includes recommendations for energy saving actions, personalized for individual customers. Akin to home energy reports (HERs), these tools are considered behavior programs and are typically offered to customers as free services on the utility's website. The tools are dynamic; the more information the customer provides, the more customized the recommendations become. Customers are encouraged to set up plans to save energy, update the tool with their progress, and then gain more information about ways to save energy in a recursive loop. The program theory is that this type of continuous customer engagement will lead to lasting behavior change with respect to energy consumption.

These tools are "opt-in," where only a subset of customers will choose to log into the site and participate. Understanding the opt-in decision is critical for expanding the use of such programs; understanding potential attribution of savings; and extrapolating participant savings to future/potential participants. Additionally, the online tool leads participants through a range of processes and captures data at every step with the goal of encouraging customer engagement. Participation or customer engagement may occur at a wide range of levels: from the initial sign-in with no other activity beyond viewing energy usage data to substantial engagement with goal-setting behavior and follow-up, thus leading to potentially highly variable savings.

This presentation will discuss the impacts from customer engagement with web-based tools based on a state-wide evaluation of the Universal Audit Tool (UAT) programs offered by California IOUs to residential customers. Questions discussed will include:

1) What are the energy savings achieved by participants when compared to a matched group?

2) How does energy consumption vary with respect to the level of engagement with the tool?

3) Do the UATs sustain online interaction over time?

4) Are energy savings significantly different for users with multi-year engagements?

5) Do tool users differ demographically from the general population?

6) Do UATs increase participation in other rebate or upstream programs?

7) What marketing efforts have IOUs deployed to drive engagement to completions? How do these efforts correlate to the levels of performance observed?

This presentation will contribute empirical evidence to this very nascent area of study regarding "opt-in online behavior programs." Findings from this research are relevant to utilities, program implementers, regulators, and others interested in energy behavior research.

Successfully Engaging Low Income Communities

Moderator: Wesley Schultz, CSU

Author: Julie Hayes, Director, Milepost Consulting, Inc.

Paper Title: SEM for Multifamily: Engaging Multiple Audiences In Energy Saving Behaviors

Abstract: Utilities in the Northwest are mandated to achieve annual energy savings that meet yearly regional standards. After decades of successful programs and initiatives designed for residential customers, revenue is flat, and energy savings targets continue to rise while the cost effective, low hanging fruit in the retrofit market has gotten more and more difficult to find. Through all of this, the multifamily market has remained an elusive target with ample opportunities to help meet these goals. While the opportunities for savings are abundant, the reality is that many multifamily properties are managed and inhabited by a collection of typically hard to reach audiences – property managers, office managers, operations and maintenance staff and residents. Properties may cater to a single resident sector but also provide housing for multiple resident demographics, ranging from market rate renters to low-income families and seniors on fixed incomes. For years, utilities have struggled with how best to engage owners, managers, office staff and residents from all walks of life to not only care about saving energy, but to act on it. Each audience possesses their own set of drivers, making engagement that much more challenging.

Having experienced measurable results in the commercial space using Strategic Energy Management (SEM,) Puget Sound Energy (PSE) decided it was time to apply the engagement, education, behavior, and planning and tracking strategies from their SEM for commercial to their multifamily market. With the help of Milepost Consulting and O'Brien and Company, PSE engaged 15 multifamily properties (a total of 35M kWh) across their service territory to participate in an SEM program with a goal of achieving 5 – 10% energy savings over 12 months. We engaged property managers in gaining a better understanding of opportunities for energy savings, planning for new projects, and direct install options; we created educational materials and conducted cohort style training for O&M staff and engaged residents through Energy Fairs and monthly education across market rate, low income, and senior properties. Included in all of this is a data driven energy scorecard that provides owners with real time energy use.

Although the program is new, the project team is seeing greater management, staff and resident engagement in low and no cost opportunities for energy savings, including; tips, tools and recognition for residents; on site assessments, education and training on energy savings strategies for operations and maintenance staff; energy savings plans (including direct install,) resident engagement strategies, tracking and access to additional utility programs for property managers that help them better support residents and reduce their overall energy costs.

This presentation will highlight this first in the country approach to engaging multifamily customers in reducing their energy use through the principles of SEM. Attendees to this session will learn more about the differences in engaging market rate, low-income and senior housing properties, and the strategies used to customize an approach based on property and audience needs and the lessons learned over the first 12 months of the project.

Author: Patrice Ignelzi, Principal Associate, Applied Energy Group

Paper Title: Encouraging Customers in Multi-family Complexes to Reduce Energy and Water Use: Off the Drawing Board and into the Field

Abstract: At BECC 2016, we made a presentation about an innovative new program under development that is designed to help both property owners/managers and tenants reduce their use of electricity, gas, and water simultaneously. The program innovations that were addressed during the design phase include: encouraging change to use of multiple resources all in one program, outreach to both property owners/managers and tenants, aggregation of energy and water use information for the entire building all in one place, experimental design that includes both opt-out and opt-in subgroups, and use of under-utilized behavior-change intervention strategies. The program, ultimately branded as Communities for Conservation, has left the drawing board and is in the field. Behavior-based programs for the multi-family sector are just starting to emerge. This one may be the first of its type to reach implementation. The participants for the opt-out group have been selected; recruitment of the opt-in group is complete; and mechanisms to deliver the services are in place. Communities for Conservation is on schedule to start delivery of program services in April 2017. In this proposed presentation, we will report on the results of the first year of implementation. Among the results we will cover are:

- The highs and lows of participant recruitment
- Processes and success for collaboration among multiple resource providers
- Finding balance in messaging for multiple resources
- Breaking through the perception that MF tenants won't care
- How the intervention strategies have been delivered and received
- Early feedback on customer response to the program

This presentation is well suited for BECC because the program is new and innovative: it contains transformative ideas for collaboration and reducing use of multiple resources, and it addresses an underserved customer group, multi-family facilities. The results we will share about this program have great potential to spark ideas and action among others to develop additional programs for other underserved sectors, such as commercial/industrial facilities with multiple decision makers.

Marketing & Design

Moderator: Matt Perry, DDB San Francisco

Author: Lonny Blumenthal, Manager, Product Localization, Oracle

Paper Title: Achieving Global Energy Savings: A Design Approach For Everyone

Abstract: Opower's behavioral energy efficiency programs reach over 60 million people worldwide and are delivered in 15 different languages. Our products are designed to give utility customers context and insight into how to save energy in their homes. To consistently motivate customers around the world to change their behavior, Opower has developed a product localization process that applies various forms of user research and leverages behavioral science to capture distinct cultural norms, language preferences, and home characteristics. This process yields a unique understanding of a market to enable targeted and relevant energy-saving communications. A network of local experts, including those from non-traditional energy backgrounds, are also critical in Opower's product development to help deliver engaging content and achieve similar outcomes globally. This presentation will share stories of our initial failed attempts at localizing product content and how we have refined our approach to build a behavioral, user-centered design process to drive consumer action through optimized energy-saving information and advice. Key results from recent product launches in Europe and Asia, such as energy saving and digital engagement metrics, will be highlighted.

Author: Lisa Lancaster, Product Manager - Retail, WECC

Paper Title: Using Market Segmentation and Targeting to Enhance Program Participation

Abstract: In 2016, WECC designed and implemented a pilot program for a collaboration of rural cooperative and municipal utilities, which focused on using geographic data to create market segments. Through segmentation, this pilot enhanced existing programs by making them more effective in recruiting participants and delivering energy savings to utilities. The pilot focused on four existing programs: Manufactured Homes, Residential and Commercial Farms, Residential Income Qualified Services, and New Construction. These programs were chosen from a portfolio of twelve programs and met the following criteria:

- Underserved or difficult to find markets
- Traditionally low realization rates when marketing to potential program participants

Further, these programs traditionally have more restrictive marketing budgets than other programs in the portfolio and therefore had more to gain from determining the most effective marketing strategies.

The primary objective of the Geotargeting Pilot was to use geodata to understand each of the four program's demographic and geospatial characteristics, and to provide resources to perform targeted outreach to those markets. To complete the market segmentation for each program, WECC used ArcGIS to combine underutilized geodata stored in existing energy efficiency program data with other market data, such as property data and census data. For example, agricultural zoning property data from counties was mapped against utility territories to create market segments for the Residential and Commercial Farms program. Prior to the pilot, no such segmentation existed and marketing for this program heavily relied on non-targeted direct mail.

Geotargeting provided valuable insights into the unique markets of the four selected programs. The key to achieving energy savings and increased program participation is to reach the right customer with the right message. Instead of communicating with all customers using the same broad messaging, geotargeting identified the market segments most likely to participate in specific programs and allowed for targeted marketing outreach to a smaller, but more accurate, customer base. Utility programs focused on underserved communities especially benefit from an enhanced understanding of traditionally hard to reach customers both geospatially and demographically. Market segmentation in the form of targeted customer lists allows for more focused marketing outreach. Those efficiencies open up resources that can be used to explore other new marketing tactics, enhanced marketing realization rates, and greater program participation and savings.

The Geotargeting Pilot provided the four participating programs with segmentation data to incorporate into the programs' marketing efforts. To continue the momentum, WECC has started a second phase of the pilot, which will use the newly created market segments and focus on targeting and positioning. The goals of the next phase are to establish the best marketing tactics to reach target customers and to determine the types of messaging that most resonate with these customers.

Designing Effective Programs For Commercial Buildings

Moderator: Amanda Dwelley, ILLUME Advising

Author: Daniel (Dan) Fredman, Consultant | Behavior & Efficiency, Vermont Energy Investment Corporation

Paper Title: SEM for SMB: DIY, YMMV, MOOC, WTF?

Abstract: Efficiency program managers successfully use behavioral strategies in the Commercial & Industrial (C&I) segment through Strategic Energy Management (SEM), often called Continuous Energy Improvement or CEI, and in the residential segment through home energy reports (HERs). However, realizing similar savings through the small-to-medium business (SMB) segment remains a challenge – SMBs share similarities with both segments that make it difficult to translate these successes. The resources required to deploy SEM programs often make cost-effectiveness difficult for SMBs because, when taken alone through the in-depth SEM process, these customers do not yield substantial energy savings like those from large C&I customers and they don't have the time to make these commitments. Given the diversity within this market, SMBs are also hard to understand and reach through general energy reports with accurate comparisons, presenting a challenge even for standard efficiency programs.

As part of the Vermont Public Service Department's 3-year Behavior R&D funding, Efficiency Vermont addressed this challenge by developing and testing a scalable SEM-like program that targets baseload or "always on" savings opportunities in the SMB market. We used strategies from behavioral economics and marketing, blended with innovative technology and big data tools, to deploy a two-phase pilot. Phase 1 deploys a randomized control trial in one Vermont utility's SMB segment (approximately 27,000 customer smart meters) that provides customized efficiency recommendations via a mailed energy report. Phase 2 deploys a randomized encouragement design to a subset of these customers who demonstrate potential for significant baseload savings. We provide a web-based, on-demand SEM-inspired training (using the tools of Massive Open Online Courses or MOOCs) that includes access to a personalized energy dashboard with customized savings opportunities and project planning tools. T

ogether, this program explores methods to create scalable peer-to-peer and account manager-to-customer relationships. The pilot design allows us to examine the effectiveness of printed reports and online data portals to trigger deeper customer engagement, behavior-based savings, and standard efficiency program uplift.

As many have observed, it's difficult to reach the SMB market and, when using big datasets, your mileage may vary (YMMV); what many do not realize is that these challenges can be resolved with better data, something that can be improved in-house with free and open-source tools.

This session describes the design and outcomes of this pilot program, as well as the challenges faced during deployment due to the extreme diversity in both customers and data quality. We offer the audience insights on how to better reach the SMB customer market using behavior-based tools and strategies, and how program managers might scale their efforts and reach a broader SMB audience cost-effectively with behavioral insights and recent developments in technology.

Author: Julie Hyde, Program Manager, Duke Energy

Paper Title: Smart Energy in Offices - Year 3 and Beyond

Abstract: This purpose of this presentation is to provide BECC attendees with insights into the success stories, lessons learned, and program enhancements that are driving results for Duke Energy's Smart Energy in Offices (SEiO) commercial behavioral Energy Efficiency program. The program currently works with more than 200 buildings comprising more than 35 million square feet of commercial office spaces across five metro areas in the Carolinas. As Smart Energy in Offices SEiO embarks on its third year, the program team is closely examining various aspects of customer journey and surveying participants about the associated benefits and challenges of engaging with program resources and staff. As part of our presentation, the program team will provide insights into the customer journey mapping exercise, and the resulting opportunities identified, to create greater participant stakeholder collaboration, streamline and enhance the employee engagement dimension of the program, and provide new tools for building operators to optimize building energy performance. Importantly, the SEiO program team has collaborated with students and faculty at the University of North Carolina Charlotte's Center for Sustainably Integrated Buildings and Sites to give building operators an extended capability to assess building energy performance and realize energy savings. Students, guided by instructors and the SEiO program's field staff, gain valuable experience by mining building automation system data trends to look for building schedule and set point tuning opportunities as well as other measure improvements Meanwhile, participating building operators ,those who have the responsibility for managing building assets and ensuring tenant comfort, are presented with an opportunity to serve as experienced mentors. The presentation will include a review of SEiO participant success stories, including participating buildings' realization of energy savings resulting from ongoing commissioning activities that are embedded in the operator engagement campaigns, building assessments and other program resources. The SEiO program operates on a continuous improvement model. Looking ahead in 2017, the program team will continue to make enhancements and adapt engagement strategies to meet customer needs and serve an expanded addressable customer population. At present, the team is in the process of seeking commission approval for a Smart Energy in Healthcare pilot, motivated by the interest and support of the largest hospital system providers in the territory. The team will present on the status of this healthcare engagement pilot and how SEiO program tools are being adapted for the healthcare environment. Program expansion will also coincide with the development of automated M&V capabilities that will give customers a real-time gauge of energy savings impacts contributed by program-related activities and other building interventions.

The current program's third party impact and process evaluation studies are due to be completed by the third quarter of 2017, thus enabling the program team to present additional findings on achieved results and opportunities for continued improvement and program enhancement.

Author: Bryan Young, Manager, Channel Strategy and Training, Independent Electricity System Operator

Paper Title: Synergies for Success: Optimized Relationships Between Behaviour-based and Measures-based Electricity Conservation Programs

Abstract: Synergies for Success: Optimized Relationships Between Behaviour- and Measures-based Electricity Conservation Programs in Ontario, Canada's largest province with a population of 14 million and a peak demand generation capacity of 36,000 MW, has an electricity conservation target of 8.7 TWh by 2020, the equivalent to taking close to one million homes off the grid for a year. To get there, the province's Independent Electricity System Operator (IESO) is integrating traditional measures-based programs with behaviour-based programs to achieve synergies and better results.

The leading example of this behaviour-based programming is the Save on Energy - Energy Manager Program. The program is among the largest of its kind in North America according to E Source with a budget of $70 million to support up to 150 energy managers who are embedded in institutional, commercial and industrial facilities across the province with a collective savings target of more than 760,000 MWh by the end of 2020. Incentives of up to $150,000 dependant on results are offered to companies to employ a qualified energy manager. Testimony to its success, a new challenge has emerged: finding highly-qualified energy managers to fill the available positions created through this innovative program. To that end, the IESO is now focussing its efforts on building a greater supply of qualified energy managers by encouraging career seekers with the appropriate qualifications to pursue high quality, well-compensated careers in energy management.

The second example is the IESO's approach to supporting training -- providing up to $9 million in training incentives to a projected 10,000 participants across a broad range of subject areas. Collectively, these third party training initiatives and the incentives provided comprise a portfolio of energy efficiency training options that can be customized into a unique training pathway for Ontario businesses and public sector organizations. The training works in parallel with Ontario's Save on Energy programs to create better quality energy efficiency projects, and build market capability resulting in a greater proportion of electricity savings that don't require ratepayer-funded incentives.

New Intervention Strategies

Moderator: Karen Ehrhardt-Martinez, Navigant

Author: Ted Peterson, Program Manager, Questar Gas

Paper Title: ThermWise Personalized Recommendations

Abstract: ThermWise Energy Challenge Nestled in the heart of the American Rockies, Questar Gas acts as the local natural gas distribution company in Utah, Idaho, and Wyoming. Through energy-efficiency efforts Questar Gas presently pays customers to save energy through high efficiency appliances and weatherization rebate programs. Now in the energy efficiency's program's ninth year, 40% of residential customers have participated in at least one rebate program. Understanding that energy efficiency will continue to shift beyond shell measures and appliance upgrades towards behavior, Questar Gas aims to create a positive intervention to reduce natural gas consumption through the ThermWise Energy Challenge.

The ThermWise Energy Challenge is modelled after Pacific Gas and Electric's 2012-2013 winter savings challenge. The ThermWise Energy Challenge moves into the new frontier of paying consumers directly for performance rather than paying for the installation of shell measures or appliances. This change will allow the consumers to develop habits and change behavior during the winter months which may persist beyond the savings challenge.

As part of the challenge, from July 2017 to September 2017, Questar Gas will recruit customers to participate in the challenge. The challenge will formally commence with the November 2017 bill through the five winter months. During this time, Questar Gas will monitor to see if through monthly email updates consumers will effectively change their behavior and reduce usage. Following the five month challenge, customers who successfully save will receive a bill credit.

This presentation aimed for BECC will highlight the company's efforts in designing, developing, and setting up a new energy efficiency behavioral program for consumers. It will also highlight preliminary results where available. The presentation aims to include a forecast for what may be the model for utilities energy efficiency programs of the future.

Questar Gas enjoys nine years of energy efficiency programs. The company's energy efficiency efforts are organized across eight distinct programs. Through 2016, 40% of customers have participated in at least one rebate program. Through 2016, the Company has spent over $200 million on its energy efficiency programs, saving more than 4 million decatherms over the life of the equipment. This is enough energy equivalent 50,000 passenger vehicles off the road each year. The company continues its energy efficiency efforts investing approximately $25 to $30 million annually on its energy efficiency programs.

About Ted Peterson: Ted Peterson is a program manager at Questar Gas where he serves with the company's new energy efficiency efforts and initiatives. He serves over the company's efforts associated with marketing analytics and IT development. In that role he created the company's ThermWise Energy Comparison Report, ThermWise Personalized Recommendations report, and is spearheading the ThermWise Energy Challenge. Previously, Ted enjoys regulatory experience with the company. He holds a MBA, Masters of Finance, and Masters of Information Systems from Utah State University and the University of Utah respectively. He is also an adjunct instructor at the University of Utah and Utah State University. He is also presently a PhD candidate at the University of Utah.

Framing Policies and Programs

Moderator: Annalisa Schilla, ARB

Author: Mary Shoemaker, Policy Analyst, ACEEE

Paper Title: Success Stories of Bipartisan Support for Energy Efficiency

Abstract: Energy efficiency is often seen as the bipartisan clean energy resource. Beyond reducing pollution, investments in energy efficiency lead to positive social and economic outcomes. Organizations and individuals across the political spectrum have supported energy efficiency because it avoids the need to expand electric generation and reduces utility bills for homes and businesses. It is also a tool for economic development that generates jobs, empowers consumers, and addresses much-needed infrastructure improvements. It moves America closer to energy independence by reducing demand for fossil fuel imports and it catalyzes innovation in our utility sector. By understanding the values of policymakers, we can more effectively change their perception of clean energy, drive support for energy efficiency, and guide the behavior of diverse market players. This presentation will highlight state and local success stories of coalitions that transcend party politics to achieve an energy efficiency victory - whether a policy or programmatic success or the forging of an unexpected alliance.

The shift of political headwinds in Washington has reiterated the importance of finding common ground between conservative and liberal values. For examples of unique bipartisan alliances to reduce energy waste, we can look to states and localities across the United States. This presentation will look at the diverse champions behind these advances, explore the priorities that brought each stakeholder to the table, and examine the specific policy outcome that ensued. As an example, in late 2016 Michigan's Republican Governor Rick Snyder signed two sweeping bills passed by the Republican majority legislature. The success of these bills, which extend and improve the state's energy efficiency resource standard, was largely due to the combined effort of a diverse coalition of corporations and conservative, environmental, and clean energy proponents. A few months later, Maryland's Republican Governor Larry Hogan allowed a bill to become law, which extends a statewide energy efficiency program. To find other examples of bipartisan support for energy efficiency, I will look at 2016 and 2017 executive and legislative developments that occurred in majority-Republican states.

Through these stories and others, I will illuminate the behavior of diverse agencies, organizations, and companies who have supported energy efficiency as a means different ends, from generating jobs to strengthening communities, and from investing in affordable housing to reducing unemployment rates. I will extract lessons learned from these experiences by exploring the specific motives of conservative, liberal, and nonpartisan groups and individuals for supporting energy efficiency. I will hone in on specific state and local policies and programs that have drawn bipartisan support and discuss opportunities for future collaboration across the political spectrum to advance energy efficiency and our clean energy economy

Residential Programs

Moderator: Ed Wisniewski, CEE

Author: Sarah Gulezian, Dynamic Pricing Program Manager, Elevate Energy

Paper Title: Gateways to Dynamic Pricing Enrollment Explosions: Lessons Learned

Abstract: Since 2007 enrollment in ComEd's Hourly Pricing program has been meager, even though the dynamic pricing electricity supply option provides residential customers with an average savings of 15%, over $16 million in cumulative savings and a satisfaction rate over 85%. Then, at the end of 2016, everything changed. Enrollments that were once stagnant, exploded! And in one quarter, more enrollments were received than in the preceding year. So…what changed? And is it replicable? In this presentation we'll uncover the best practices behind our success and provide insights to drive enrolment in demand response and energy efficiency programs. As a nonprofit administrator for Hourly Pricing programs in Illinois since 2003, we've had the ongoing challenge of marketing these innovative programs in the face of an ever-changing market landscape. We'll reflect on what's worked and what hasn't, and focus specifically on the changes that ignited enrollments in 2016.

The explosive growth of the Hourly Pricing program was no accident – the increased AMI deployment and applied learnings from intensive customer focused market research created the perfect storm. Through customer segmentation based on theories of gateway program participation, stripped-down enrollment forms, and simpler value propositions, we improved our response rate of a direct mailer from less than 1% to over 7%. And that's just the beginning. This year we are taking the insights from the marketing results a step further by testing brand new channels of engagement to demonstrate how this dynamic rate option can easily increase a customer's ability to save energy and money. We will compare the results from the different gateway tactics to create users of Hourly Pricing, including Peak Time Rebate programs and smart thermostat owners.

Author: Alex Katzman, VP Growth, Enervee

Paper Title: Getting Customers To Choose Efficient Products Without Financial Incentives

Abstract: Many utility residential EE programs are focused on providing a monetary incentive to the customer to try to lower the cost of the product. While this approach can be very successful, it is becoming increasingly cost prohibitive for many categories of appliances and especially electronics. Enervee in partnership with Snohomish PUD and C+C used an innovative incentive design on the Snohomish PUD Smart Rewards Marketplace (smartrewards.snopud.com), providing EE product giveaways instead of or in combination with cash.

The results were quite astounding with a 3.8X increase in kWh saved from 2015 to 2016 and with a 32% increase in program cost effectiveness. In addition, one of the most interesting takeaways was that 51% of the incentives claimed were for purchases that received an EE Savings Kit incentive including LED bulbs, a Showerhead adapter and an Advanced Power Strip. On a survey, 95% of customers using the Smart Rewards site said they would come back again for their next purchase and 69% of customers found the Energy Score to be the factor that influenced their purchase decision, even more than the incentive being offered.

In 2017, the Snohomish PUD changed the Smart Rewards Marketplace EE Savings Kit to include only LED bulbs and will be expanding the offering to cover new categories that previously did not have downstream incentives offered such as Soundbars, Air Purifiers and Room Air Conditioners. We will track results comparing the uptake and savings from the 2016 vs 2017 offering.

Additionally over the next few months, Enervee will be designing and running a controlled trial to tease out the non-financial/cash in kind effect. We will plan to share these results at BECC as well as behavioral data on what we have seen as the biggest non-financial drivers of getting customers to shop energy efficient.

Author: Rodrigo Lagreca, CEO, HomeCarbon

Paper Title: Gathering Learnings From A Behavioral Methodology Aimed At Rio De Janeiro Low Income Communities With High Incidence Of Energy Commercial Losses

Abstract: Energy commercial losses play a relevant economic role in Brazilian utilities nowadays, with a domestic average loss of about 5,74% in residential customers, mainly due to irregular connections in the grids. Greater Rio de Janeiro area, for instance, counts about 23,1% of losses in residential customers. Frauds are more present, but not exclusively, in low income communities. Add to that, the economic crisis the country is passing through triggered also delinquency rates, so both – frauds and delinquency – have raised their importance in utilities strategic agenda. In this scenario, utilities located in RJ state have made considerable efforts towards trying to bring these customers to regularity, aiming also to recover revenues. As part of these efforts, a behavioral program was engaged in Rio de Janeiro city low income communities beside customers being transitioned from irregularity to regularity. They were approached with real time feedback tools, brochures and awareness as way to engage them in a more efficient and sustainable energy consumption behavior. The approach consisted in simulating their current consumption behaviors, then compared to a more efficient one, displaying the total money amounted spent per month, accumulated in one, five and 10 years, based mainly in home appliances using time and their efficiency official standards. The IT simulation assembled a “behavioral plan”, which is printed and delivered to customers to take their homes, easing them to adopt new habits and behaviors. Preliminary trends analysis has indicated the treated group (approached with the behavioral program) as more resilient to consumption seasonal increase than the non-approached group, thus having decelerated their consumption increase inherent to market seasonality. While the outcomes are still being assessed and gathered with more primary data, above all, this case also has shown how behavioral tools may be engaged to mitigate a recurrent issue to Brazilian utilities, market and society.

Author: Jim Malcom, EVP, Apogee Interactive, Inc.

Paper Title: Connecting with Low Income Customers

Abstract: According to the most recent U.S. census data, there are 43.1 million people living in poverty and the median 2015 household income was 1.6 percent lower than pre-recession 2007 household income. Low income customers face numerous challenges in their daily lives two of which are understanding and paying for energy. Utilities often struggle with serving this customer segment in a manner these customers truly value. Apogee Interactive has created a complete end to end solutions which provides these customers Choice, puts them in Control and demonstrates the utility is Caring. We call this solution EPIC (Engagement Platform for Income Challenged).

EPIC is a behavioral solution focusing comprised of useful, simple, and timely communication strategies including specific energy tools for this customer segment. The stages of EPIC are:

- Identify, recruit and enroll customers
- Provide specific tools for EPIC customers
- Provide choices for communication modality
- Identify valuable and cost effective energy projects
- Create awareness of utility and community programs
- Provide timely and actionable information

Apogee has developed a suite of tools specifically for income challenged customers. These tools are based on Apogee's award winning and thoroughly tested analytical engine being used by over 600 energy utilities and provide meaningful and useful energy advice for this customer segment. All energy recommendations require very little or no financial investment by the customer. All tools and communications are focused primarily on mobile devices as this is the most likely form of Internet connection with these customers. Once a customer enrolls in EPIC they will receive is simple and timely communication which provide timely and simple actions consumers can take to improve their comfort and energy consumption.

Beyond communicating energy information, EPIC will communicate information to customers concerning the sponsoring utility's billing and payment options as well as location for authorized payment centers. Unlike other low income offerings, EPIC does not have an income qualification requirement. The focus of EPIC is to provide consumers with energy information that they can easily use. For example, if the weather forecast is predicting very high summer temperatures, the consumer would receive a message to keep their binds closed on west facing windows during the afternoon to improve the comfort in their homes. EPIC can either stand alone or become integrated into an existing utility program and can be offered within community action agency outreach. Both the consumers and utility benefit from EPIC in the following manners:

Consumer

- Transparency to energy costs and usage
- Energy education
- Improve comfort

Utility

- Improved customer satisfaction
- Lower operating costs
- Reduced call volume
- Improve cash-flow
- Reduce bad debt and collection activities

Apogee will present the results of this efforts with BECC.

Author: Elizabeth McCollum, Program Manager, TRC Energy Services

Paper Title: A Flexible, High-Impact Approach To New Mexico's First Multifamily Program

Abstract: TRC designed and administers the first multifamily energy efficiency program in New Mexico, on behalf of PNM – and through this experience, has key insights and lessons learned to share. When we began working with PMM in 2015, the utility was eager to better serve the hard-to-reach multifamily market segment. TRC implemented a tailored program design for multifamily units / common spaces across a dispersed, low-density (often rural) population with unique cultural challenges and a large disadvantaged segment.

Interest in the program was immediate, but applications began to plateau—at which point TRC made critical program design adjustments that resulted in big wins. Examples include:

1) delivering behavioral science-inspired messaging and communications to customers,
2) offering customer incentive bonuses based on energy savings achieved, early adoption, and low-income statuses,
3) providing "easy entry" ways for customer participation with paths to deeper savings, and
4) designing the program to be very attractive to and supportive of trade allies (improving overall impact and cost-effectiveness).

As a result of these improvements and learnings, project applications for the program tripled in three months and increased tenfold in six months. Today, the program is oversubscribed for 2017 and includes a waitlist for 2018.

The session will explore the logic behind the program's design journey and will engage the audience in a discussion about maximizing program success across challenging populations. Key takeaways for the audience will include emphasis on:

- Effective programs not only overcome common obstacles, but also meet local and cultural challenges (e.g., low-density population engagement).
- Flexibility to rethink program design and make adjustments is crucial to large-scale energy savings and client satisfaction.
- Get creative identifying and implementing levers to engage customers via messaging, incentives, offerings, and stakeholders.
- Consider easy access points for customers, with paths to deeper savings.
- Cultivate a strong trade ally network to amplify customer engagement and reduce administrative effort.

Putting Customers' Needs First

Moderator: Susan Norris, PG&E

Author: Joel Gilbert, Chief Software Architect, Apogee Interactive

Paper Title: What Are Thermostats Really Doing?

Abstract: Everyone has at least one thermostat in their home, but almost no one knows exactly what it is doing. SMUD performed detailed temperature measurements in 20 area homes and asked five of today's energy analysis firms to tell them what you can see and learn by doing that. The results of this year-long evaluation will be presented.

Energy utilities will be interested to see how energy analytics can improve customer targeting for EE and DR programs as well as reduce the cost of and/or eliminate in home field audits. Energy technology providers will be interested to see how new low cost temperature analytics can augment energy information presentations and produce new insights into home EE and DR potentials. Energy industry consultants and regulators will be interested to see how the above can open up a new range of EE and DR potential in the low income, apartment and home renter markets. They will also be interested to see that smart grid data, while powerful, is not needed to build EE and DR capabilities.

Author: Ingrid Rohmund, Vice President, Applied Energy Group

Paper Title: Leading with Behavior -- Does It Make a Difference?

Abstract: Utility and industry forecasters typically focus on “sales,” usually at an aggregate level, and they use the past to predict the future. DSM market potential studies analyze and project customer use at a more granular level, usually by customer segment and end use. These studies focus on appliances and equipment, with a little bit of “customer behavior” squeezed in through usage factors (UECs and EUIs) and generic “behavior programs.” However, the emphasis is larly on energy-consuming gadgets used by “average” customers in each segment. While ubiquitous and fairly entrenched, the typical analysis approach does not lend itself to understanding what happens if customers change their behavior either with or without enabling devices. This paper will explore how the results and the story change when we shift the focus to customer needs and preference for energy services first and then select the appliances and devices were selected to meet those needs. Take the example of domestic water heating. Current analyses start with the type of water heater equipment and then guestimate the amount of usage. The alternative would start with number of warm showers, loads of dishes, etc. that a household needs and wants, layers in qualitative characteristics like “I am very concerned about water conservation” or “I don’t care at all about water conservation,” selects the appropriate appliance and devices to meet customer preferences, and calculates energy use and utility bills. Would the forecast of electricity use for water heating be significantly different? Would this approach provide insights useful to program design, forecasting and marketing? This presentation will describe the results of a simulation of single-family homes for a specific utility covering all major end uses. We will integrate research that has been presented at previous BECC conferences about customer attitudes and preferences, as well as emerging technologies and customer feedback mechanisms. While the paper and presentation will provide a brief overview of the analysis approach the focus will be on the insights we gain from this alternative approach. (It would be nice to have a utility partner for this presentation and we are in the process of identifying one or more.)

Renewable Energy

Moderator: Elaine Ulrich, DOE

Author: W. Scott Hoppe, Founder, Sabreez

Paper Title: Residential Demand Response using a Single Variable Information System

Abstract: California is breaking records for combined solar and wind power production concurrent with low system-wide demand. With 16GW of solar on both sides of the meter, sunny days can turn prices in California negative. When it is both sunny and windy and demand is low, solar and wind energy get curtailed to the tune of millions of kWh. That is a lot of curtailment, which will only grow as solar continues to be deployed.

One company, Sabreez, is tackling consumer education and behavior change with the Wind Number. Sabreez has defined the Wind Number as the ratio of power coming from wind divided by the power coming from fossil fuel sources, multiplied by 100, giving consumers an easily graspable metric for how much clean energy is powering their homes. There is an app for iPhone or Android devices letting consumers see real-time energy production in California through which Sabreez provides energy consumers with a daily clean energy forecast based on anticipated wind and solar output for the day. By referring to the Wind Number, consumers can shift their energy use, save money and reduce their carbon footprint. Messaging on time of use rates, hourly availability of clean energy, and energy saving technologies, all contribute to positive reinforcement of clean energy consumption.

The primary channel for the Wind Number is Facebook, where it has nearly 4000 followers. In December, Sabreez, with the help of Indicia Consulting, surveyed the sample of people who had followed the page, to understand the meaning, significance, and impact of wind number acquisition on their behavior (self-assessed). This presentation will discuss the results of that survey, and implications for the use of social media and load shifting in California. For example, if programs spend $100k on social media, how many kWh of load shifting could potentially be achieved via the Wind Number? How many MW of control via the Wind Number can be potentially realized? Evidence also exists that the Wind Number, as a free app and Facebook page, disproportionately attracts a young, low income audience, who will see their rates increase in 2019 and be strongly incentivized to adopt new behaviors and technologies.

Author: Melissa Miyashiro, Chief of Staff, Blue Planet Foundation

Paper Title: Project RePower: Empowering States through Renewable Energy Targets

Abstract: Today, more than ever, states must lead the push for renewable energy and climate action. In 2017, Blue Planet Foundation and the National Caucus of Environmental Legislators (NCEL) have partnered to launch Project RePower, an initiative to accelerate renewable energy standards at the state level.

Project RePower is convening a network of state legislators from a range of geographic regions and political affiliations. Leveraging Hawaii's experience with adopting and implementing the country's most advanced renewable energy law, this network is helping legislators understand the power and impact of renewable energy standards.

Blue Planet Foundation, a Hawaii-based nonprofit committed to ending the use of fossil fuels, led the campaign to pass the state's 100% renewable portfolio standard (RPS) in 2015. Hawaii's experience with the nations' first 100% RPS is illustrating how aggressive renewable standards can promote energy collaboration, prioritize distributed energy resources (DERs), and spur new approaches to value creation. Hawaii's 100% renewable energy law is already showing how bold clean energy targets can: save billions of dollars; reduce greenhouse gas emissions; increase energy and economic security; foster stronger public and private collaboration; and help utilities thrive and create new approaches to value creation.

Energy-smart legislators will be better prepared for an era where lawmakers are being called upon to reform the energy regulatory model so that it can keep pace with innovation. By providing legislators with information, access to energy experts, technical resources, and mutual support, Project RePower will assist legislators as they advance renewable energy standards in their home states.

At the BECC conference, Blue Planet Foundation will report results from the first two key components of the initiative. First, a core team of experts in policymaking, modeling, and grassroots strategy will meet at Rocky Mountain Institute's eLab Accelerator (Utah, April 2017) to identify barriers and opportunities and create an action plan for the initiative. Second, the NCEL Annual Meeting of environmental legislators (coincident with National Conference of State Legislators Summit, Boston, August 2017) will feature action-oriented breakout sessions dedicated to the topic of advancing renewable energy standards. The purpose of this stage is to build on the Accelerator strategy with a broad range of legislators (more than 70 sitting legislators attend the multi-day meeting) who can take action in their home states.

Sharing the findings from Project RePower at BECC will lay the foundation for planned follow-up activities that begin to turn the strategy into action. In December 2017, Blue Planet Foundation will convene a subset of bipartisan legislators at the Puu Waa Ranch microgrid (Hawaii Island). This workshop will serve as a check-in for legislators who are actively participating in the network and/or introducing renewable legislation. This will be an opportunity for legislators to learn about the feasibility and benefits of 100% renewable energy in the context of the microgrid (e.g., solar power, batteries, hydrogen), and to learn about the details of the Hawaii experience (e.g., leveraging utility and regulatory support for 100% RPS).

Author: Jennifer Robinson, Electric Power Research Institute (EPRI)

Paper Title: Leveraging Discrete Choice Experiments to Forecast Residential Solar PV Adoption

Abstract: As distributed solar photovoltaic (PV) systems continue to proliferate, electricity service providers are under increasing pressure to attain a more complete understanding of their customers' perspectives (i.e., their wants and needs) surrounding residential solar. They are, moreover, challenged to develop methods and tools that can translate their customers' preferences into predictions of market adoptions to adequately inform distribution planning, program development, and other efforts. For example, the ability to evaluate the impacts of changes over time to capital costs, technology efficiencies, and policies and incentives on customer adoption likelihood, method (upfront purchase, lease, community solar subscription), and location, would greatly benefit electricity service providers in their planning and operations activities.

Leveraging Discrete Choice Experiments, the Electric Power Research Institute (EPRI) has designed and developed the Residential PV Adoption Forecasting Tool (PVAT) to help electricity service providers begin to better characterize scenario-based PV adoption outcomes at a higher resolution of geospatial granularity. The PVAT combines an econometric model of consumers' residential solar preferences, estimated from a Residential Solar Survey administered in 2016, with an individual utility service territory's census-based, demographic data (e.g., gender, age, and race breakdowns by ZIP Code). This approach allows the user to evaluate how many customers are likely to choose different residential solar alternatives in an individual utility service territory based on varying residential solar characteristics (e.g., system size, performance, savings, and costs). It additionally allows the user to evaluate how many more or fewer customers may choose residential solar as attributes are varied (e.g., costs fall by 30% over the next five years). And finally, the tool has the ability to export data for use in external GIS mapping programs to visualize results.

This presentation will describe the aims and objectives of the PVAT project, as well as the approach employed, leveraging the social sciences methods (conjoint analysis), to develop the PVAT tool and its underlying architecture. It will furthermore briefly demonstrate the tool to help showcase how it provides an intermediate step towards enabling a more holistic approach to grid planning. By ultimately merging forecasting with hosting capacity analyses (i.e., evaluations that identify the level of PV penetration a circuit can accommodate without violating power quality and reliability thresholds), utility grid planning efforts can be made both more technically and economically efficient.

Feedback and Behavioral Demand Response

Moderator: Jim Parks, SMUD

Author: Patricia Aloise-Young, Associate Professor, Colorado State University

Paper Title: Preferences for Demand Response Behavioral Sacrifices

Abstract: There is a growing interest among utilities in the potential contribution of residential demand response (DR) programs to peak reduction in their control area. A study of demand side management initiatives across 23 electric utilities in North America showed residential demand savings of up to 120MW from a single utility alone [Gunn, 2005]. Most DR programs to date have utilized distribution automation, load curtailment by controlling the end use loads, by providing homeowners with smart thermostats or another form of direct heating/cooling control [e.g., BusinessWire, 2012]. However, the growing penetration of other forms of smart appliances in the residential market, together with utility investments in smart grid infrastructure open up the possibility for DR savings to come from a wider range of behavioral savings beyond heating and cooling. The key question, however, is how willing will consumers be to change their energy routines in response to a DR event?

In the present study, we developed three surveys to explore consumers' preferences for giving up the desired heating setpoint, the desired cooling setpoint, a comfortable shower of normal duration, clean dishes at a time of one's choosing, and clean clothes at a time of one's choosing. Approximately 1,000 individuals completed each of the three surveys using Amazon's MTurk. Different methodologies were used to assess preferences in the three surveys: Analytic Hierarchy Process (AHP), Discrete Choice Modeling (DCM), and a Simple Multi-attribute Rating Technique Exploiting Ranks (SMARTER). In AHP, the priority weights were calculated from participants' pairwise preference comparisons among potential DR sources (e.g., having clean dishes at a time of one's choosing versus having clean clothes at a time of one's choosing). In AHP these raw ranks were weighted by the cost and carbon footprint profiles for each appliance.

In DCM, participants rank ordered a series of situations that included different combinations of desirable/undesirable DR sources (e.g., having a desired air temperature setpoint, taking a comfortable shower of normal duration, not having clean dishes at a time of one's choosing, and not having clean clothes at a time of one's choosing vs having an air temperature setpoint that is too hot, taking a comfortable shower of normal duration, not having clean dishes at a time of one's choosing, and having clean clothes at a time of one's choosing). From these decisions, the parameters in a hypothesized utility function were estimated. In SMARTER, individuals rank ordered the DR sources and weights were inferred. Participants were more likely to report being too hot was worse than being too cold. The SMARTER method revealed that consumers ranked the potential DR sources in the following order (from most likely to sacrifice to least likely to sacrifice): having clean dishes, having clean clothes, shower length, shower temperature, and finally air temperature. In contrast, the AHP method, which takes into account both the consumers' relative preferences for the DR sources and the cost/carbon of savings from making each sacrifice, predicted that consumers would be most likely to sacrifice cooling and heating and least likely to sacrifice having clean dishes.

The merits of each approach for assessing DR behavioral sacrifice preference are discussed. In addition, the implications for utility demand side management program design are explored.

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Author: Kira Ashby, Senior Program Manager, Behavior, Consortium for Energy Efficiency

Paper Title: Going the Distance: Behavioral Persistence in Utility Energy Efficiency Programs

Abstract: For years, a key barrier to implementing behavioral energy efficiency programs has been uncertainty about how long any energy savings achieved may last, known as persistence. This uncertainty has led many jurisdictions to continue to hold behavioral programs to a one-year measure life, even though actual savings may last longer. Improving our understanding of the duration of persistence is crucial for both program and portfolio design, particularly due to the implications for improved cost-effectiveness, enhanced program credibility, and more accurate resource planning. This presentation would combat prevailing uncertainty by synthesizing and detailing recent findings on behavioral persistence in energy efficiency programs—pulling from nearly a dozen behavioral persistence studies by utilities. The presentation would shed light on how rapidly savings from behavioral programs are expected to decay after a program has ended, and explore factors that may encourage or hinder that persistence. Attendees to this session would come away with a better understanding of average savings decay rates for behavioral programs, insight into how program characteristics—such as duration of initial program roll out and initial energy savings observed—can correlate to higher or lower persistence, as well as a list of topics that are particularly ripe for future behavioral persistence research.

This research has already been completed and the results synthesized, but has not yet been presented at any conference. The scope of this research is currently restricted to home energy report-style behavioral programs, primarily because that is the program type whose persistence has been the most widely and rigorously tested to date. Nevertheless, these results provide an important starting point—both in terms of methodology and expected decay rates—for future research to build upon in pursuit of a greater understanding of behavioral persistence across a broad array of program types. Overall, findings suggest that behavioral persistence appears to decay at an average rate of around 20 percent annually once a program has ended, but the decay rate is not linear (decay appears to accelerate over time) and there appears to be substantial variation in decay rate across programs.

Author: Wonjong Rhee, Professor, Seoul National University

Paper Title: Who Should Join DR? Modeling with Machine Learning and Credit Scoring

Abstract: Household sector's power consumption has been steadily increasing, and it is expected to become 41% of overall consumption within the next 20 years. Besides the large share, household sector can be influential because the educational activities therein can play a significant role in improving social awareness of energy use. In these contexts, residential Demand Response (DR) is considered as an important tool for solving the imbalance problem of power supply and demand.

For the large-scale industrial power consumers, devoted employees are involved in running their DR programs, and often they have sufficient expertise in the related fields. Therefore, the operators are mostly interested in improving prediction accuracy and maximizing cost efficiency. In contrast, residential DR is conducted over general public and the operators need to deal with a variety of inquiries and complaints in addition to the accuracy and efficiency.

In this study, we consider a residential DR program of incentive based peak power reduction where invitation for participation is sent selectively. The selective process can be crucial for improving efficiency of the program, because there are customers who do not change their behavior at all but take rewards due to the natural variance in their life patterns. While a selective process is a viable direction for efficiency improvement, it can have an adversarial effect and result in fairness complaints. In this case, obviously the process needs to be made as fair as possible, but it is also essential to maximize the explainability of the selection process such that the operation of the program can be made smooth.

To address this problem, we propose a customer participation behavior prediction model considering both accuracy and explainability, where the accuracy advantage of Machine Learning (ML) and the explainability advantage of Credit Scoring (CS) are combined. For the study, data was collected from 13,925 households in Korea for one year in 2016. ML algorithms, with up to 57 features, were studied and showed a fairly high prediction performance (test accuracy 0.944, AUROC 0.942), but they were too complicated to satisfy explainability. A CS method of grouping with a score sheet was adopted, and the explainability was acceptable because the model has been heavily tested in the financial sector already. Its performance, however, was much inferior because DR data is completely different from financial data where the customer behavior is most important for DR. To this end, we define a modified CS method using CS as the base but with ML concepts such as forward feature selection and marginal probability for accuracy. While this modified CS method maintains its explainability via a well-defined score sheet, it also shows comparable prediction performance as ML's (test accuracy 0.942, AUROC 0.929).

The modified CS method is expected to affect residential DR in a positive way. Its high accuracy for predicting customer participation behavior means a large potential for improving efficiency. Its explainability means not only an easier interaction with customers but also less effort for educating call-center agents who need to deal with the customers.

Spotlight on Efficiency in Schools and Hospitals

Moderator: Taghi Alezera, ADM Associates

Author: Emily Cross, Managing Consultant, Navigant Consulting, Inc.

Paper Title: Evaluation Methods to Avoid Undercounting Savings in Behavior Programs

Abstract: How much of the energy savings from behavioral programs is undercounted in a typical program evaluation, and should we be using a different approach to measure savings? Energy savings constitute a critical metric in the evaluation of behavioral programs. This presentation looks at how measurement decisions affect evaluation results and puts forward recommendations on best practices for more accurately calculating savings.

The purpose of this work was to use hourly electric data to develop estimates of the energy savings generated by a school based behavior program that relied on the actions of a variety of actors (including teachers, children, and facilities staff) to reduce energy consumption. The study considered the following set of questions: How might traditional energy savings analysis methods be leveraged and should they be modified? Was a measureable amount of energy saved? How much confidence do we have in the measured savings? Do the savings persist over time?

The evaluation resulted in the development of an innovative approach to analysis and a set of best practices for accurately representing behavior-based savings. More specifically, the pre minus post evaluation used a weather normalized approach to study the energy impacts of behavior change actions in a middle school over the period of a few months.

In order to fairly represent program impacts when actors were not physically present, such as evenings and weekends, we divided the analysis into several periods, such as daytime/nighttime, and weekday/weekend periods, ensuring that each period had consistent energy use profiles. We also performed three sensitivity studies in order to estimate error bounds on the calculated savings.

The study found that different approaches to analysis resulted in different savings estimates depending on which schedule periods were specified and which sub-metered loads were included. Specifically, higher savings with lower uncertainty resulted from more accurate assumptions about the specific program actions taken and the relevant hours of operations.

Our high level findings revealed three important insights: (1) it is difficult to fairly represent the energy impacts of behavioral programs without direct knowledge of which program actions are being taken and which types of loads are being targeted; (2) measuring the energy savings associated with particular actions and loads can be successfully addressed by dividing the analysis into meaningful time periods such as day/night, and weekday/weekend; and (3) in this case study, energy savings proved to be sensitive to the direct influence of program implementers, suggesting that the savings from behaviors did not persist beyond the planned program actions.

The evaluation methods discussed here are broadly applicable for behavioral programs across commercial buildings with hourly billing data (such as from smart meters). These findings should be further tested and reflected in program design and evaluation protocols and in policies governing monitoring of behavioral program outcomes.

Energy Efficiency in Diverse Contexts

Moderator: Bruce Ceniceros, Aluminum Coating Technologies

Author: James Reese, Senior Consultant, California Manufacturing Technology Consulting

Paper Title: Customer Characteristics that Lead to a Successful Strategic Energy Management (SEM) Program

Abstract: For the past seven years, Southern California Edison (SCE) and Southern California Gas (SoCalGas) have conducted a Strategic Energy Management (SEM) program called the SCE/SoCalGas Continuous Energy Improvement (CEI) Program. The program has included engagements with commercial, industrial, and agricultural customers. California Manufacturing Technology Consulting (CMTC) supported the program as a CEI Advisor for industrial and agricultural customers. This program has focused on operational (behavior, operations, and maintenance) energy savings measures in addition to energy efficient equipment upgrades.

For a utility SEM program to be cost-effective, it is essential to be able to qualify candidate customers so that those enrolled in the program have a high probability of success. SEM is a long term strategic program that may last five years or more. Also, SEM requires considerable upfront and sustained investment of resources by both the sponsoring utilities and customers. If customers are not successful in sustaining the SEM program, many of the long term benefits of the upfront work may not be realized.

This paper will discuss findings related to the behavioral drivers and barriers that led customers to varying levels of success with SEM based on experience with over 20 multi-year engagements at industrial facilities. In addition, two examples will be provided showing the characteristics of companies that overcame the barriers to develop highly-successful and long-term sustainable SEM programs. Commitment of management is the first step for a customer to qualify for SEM participation. Experience has shown, however, that customers that provide commitment early in the program may not be able to sustain the SEM program over the long term as commitment wanes. Barriers that can impact the ability of industrial customers to commit to an SEM program or to sustain their commitment over the long term include:

- Low priority of energy costs compared to other business needs or changing business priorities during the course of an SEM engagement,
- Required upfront work to establish the SEM program,
- Availability of staff resources and funding for implementation of energy savings measures
- Resources required to compile and analyze production and energy data, and document O&M changes that affect energy use
- Changes in business management or ownership
- Changes in product mix

Two examples of customers that have been successful in overcoming these barriers and sustaining an SEM program over the long term will be discussed in the paper. The discussion will include:

- Time frame of customer business planning,
- Motivation of management to engage in the SEM program,
- Impact of establishing a goal for energy savings,
- Resources provided by management to support the program,
- Characteristics of the SEM energy team,
- Impact of increased employee energy awareness and behavior changes,

- Recognition by management of the success of SEM and commitment to continue the program for the future.

The experience presented in the paper will identify essential characteristics for SEM success. These characteristics form the basis of in-depth assessment of the capability of candidate customers to implement and sustain an SEM program. Such an assessment can lead to a more cost-effective utility SEM program.

Social Norms

Moderator: Gene Rodrigues, ICF

Author: Guillaume Calas, Strategic Analyst, Pacific Gas and Electric Company

Paper Title: Home Energy Reports – Avoiding a Mid-Life Crisis

Abstract: Pacific Gas and Electric Company's (PG&E) Home Energy Reports (HERs) is one of the oldest and largest behavior-based energy efficiency programs in North America. Launched in summer 2011, it now impacts 1.5 million households by sending printed and/or email reports. These reports leverage the power of social norms to encourage customers save energy by comparing their energy consumption to one of nearby similar homes. Reports also contain energy efficiency tips and information about other Energy Efficiency programs offered by PG&E. Industry-wide average savings per household is modest, generally ranging between 1.0% and 2.5% for electric usage and 0.5% and 1.5% for gas usage. One upside of the HERs opt-out design is it enables enrolling large populations; because of this, HERs is a significant savings contributor to PG&E's Residential Energy Efficiency portfolio (50% for ex-post first year net electric savings in 2014). Though HERs appear in their prime today, challenges on the horizon could create a 'mid-life program crisis' impacting long-term program viability and effectiveness. How to reinvigorate depressed HERs programs without putting them on Prozac? This presentation synthesizes key learnings and strategies for continued program success from six years of PG&E implementation. Three key metrics are at risk:

- Long-term savings or 'fixing poor life habits': the common "low-hanging fruit" strategy to target the highest-energy users has slowly reduced the savings potential of the pool of eligible households not yet enrolled in the program. Customer attrition – i.e. customers moving out of their homes (and then being removed from the program) – also poses a threat to current and future savings. Leveraging interval meter data and developing customized behavioral treatments can provide avenues to capture more savings and avoid HERs programs from suffering a reduced life expectancy.
- Customer engagement/satisfaction or 'reframing the communication': the opt-out design and generic approach used by many HERs programs raise challenges associated with satisfaction and report fatigue in participating households. No need to buy a Corvette: reinventing the customer experience to promote deeper engagement, especially across more mature HER experiments, in order to refresh the purpose of the program for customers. Hint: think (report) face lift to stimulate savings.
- Cost-effectiveness or 'financial health': newly developed empirically-derived savings load shapes help capture measure benefits during peak hours more effectively. The observation of savings persistence also demonstrates that current savings accounting methodologies are inefficient, especially around measure life.

Author: Beth Fitzjarrald, Research Manager, E Source

Paper Title: Utility Behavioral Demand Response Programs: Cost-effective Demand Savings

Abstract: Traditional residential demand response (DR) programs require costly devices, costly installation of those devices, and costly financial incentives to entice customers to participate. The program design is often fairly unappealing to those customers, as it requires them to sacrifice their comfort on the hottest days of the summer, and even more so, give up control of the comfort of their home.

Several utilities are exploring a new demand response option, using social-science-based normative messaging, similar to that used in popular home energy report programs. The early pilot results point to reliable peak savings with lower cost and high customer satisfaction. There have been some forays into behavioral DR in the past, with several California utilities using community-wide messaging asking customers to please save on hot summer afternoons. Those efforts saw little in the way of verifiable savings. Now utilities are learning from home energy reports and changing generalized community messages to highly personalized interactions.

Personalized behavioral DR works by sending individual social norming messages - how much are you using in comparison to your neighbors and your historical self - to inspire residential customers to reduce energy use during peak events. Customers get feedback just before a peak event asking them to save, then get a follow-up message several days after letting them know how they did. These behavioral DR programs use no rates or financial incentives, no costly devices, just intentionally-worded personalized messaging.

E Source has reviewed leading behavioral DR programs and found that energy savings from these programs are noteworthy, ranging from 1 to 5 percent, with savings during each peak demand event averaging around 1.5 to 3 percent. Naturally, before investing in programs like this, utilities want to know if these savings will persist year-to-year and how many customers will choose to opt-out. Early results in both of these areas are promising for program managers.

In this presentation, attendees will learn why several utilities are pursuing behavioral DR and hear case studies with verified results from 3 of the top utility behavioral DR programs in the country. We'll discuss key concerns including savings persistence, opt-out rates, verification, and customer response. Highlights include:

- Behavioral DR can be cost-effective.
- Program results over two consecutive summers, with low (6-8 percent) opt-out rates.
- Early analyses of savings persistence, with consistent savings across two seasons and several back-to-back events.
- Customers satisfaction results -- they seem to like it.

While the magnitude of savings from this type of program won't make it a demand response silver bullet, early results indicate this might be a useful added tool in the peak-shaving toolkit.

Author: Vedran Lesic, Mr, Leeds University Business School

Paper Title: Assessing Consumers' Perceptions Of Electricity Use: Does Providing Reference Points Help?

Abstract:

INTRODUCTION Consumers often find it hard to assess how much electricity is used by their household appliances. Providing a 'reference point' (or how much electricity is used by another appliance, such as a single light bulb) can be a simple yet effective strategy to improve the accuracy of consumers' perceptions of appliances' electricity use (Attari et al, 2011). The aim of this study is to test whether the provision of single or multiple reference points improves consumers' perceptions of appliances' electricity use.

METHOD In a US online survey, 504 participants reported their perceptions of electricity use (in Watt hours) for nine different appliances (e.g. air conditioner, electric oven, dishwasher, etc.) as used over the course of one hour. Participants were randomly assigned to receiving one of five experimental conditions: (i) no reference point, (ii) a single low reference point (light bulb), (iii) a single high reference point (electric dryer), (iv) two reference points, one low and one high (light bulb and electric dryer) and (v) three reference points, including one low, one medium, and one high (light bulb, washing machine and electric dryer).

RESULTS We found that providing one or more reference points (rather than no reference point) influenced the accuracy of perceptions of electricity use across all of the appliances presented. Specifically, participants who received a single low (e.g. light bulb), or two or three reference points reported more accurate perceptions of electricity use for specific appliances. This findings confirmed that providing participants with a potential range of values improved their judgement of the frequency of their behaviors, but only when the range is based on representative information which was the case in this study (Schwarz, 1999). Also, in conditions with two or three reference points, participants were more confident in their estimates and perceived the task as less difficult. Furthermore, participants in our study underestimated the use of high electricity consuming appliances (e.g. air conditioner, dishwasher) but overestimated the use of low electricity consuming appliances (e.g. laptop, TV).

CONCLUSIONS Our findings suggest that reference points play an important role in improving the accuracy of perceptions of electricity use across different appliances. We discuss the importance of incorporating reference points in the design of effective electricity feedback for consumers.

Author: Elizabeth Palchak, University of Vermont/Vermont Energy Investment Corporation

Paper Title: Casting A Wide Net: What We Know Now About Behavioral Strategies And Energy Use

Abstract: Casting a wide net: what we know now about behavioral strategies and energy use This lighting-round presentation will report on a section from a meta-analysis on pro-environmental behaviors related to water use, land-use, family planning, meat consumption, recycling and energy use. This meta-analysis, "Encouraging pro-environmental behavior: what we know about what works" (forthcoming publication) is the result of a two-year collaborative project out of the Gund Institute for the Environment at the University of Vermont. Researchers focused on experimental designs testing behavioral strategies and captured statistical significance, sample size and noteworthy findings. The MINDSPACE Framework developed by the UK's behavioral insights team served as a way to capture and coalesce the various behavioral tools applied across many different behaviors and many different research experiments. To develop new insights about the state of behavioral science and energy use, we examined seven frequently cited meta-analyses. In recording statistical significance, sample size and capturing the type of behavioral strategy a "grid" was created illuminating areas of high impact (like the combination of commitments and information feedback) and areas of promise that require more experimentation (like more effectively leveraging the messenger effect). One of the most striking areas of discovery was related to the effects of social norms when examined across various studies, despite the popularity of strategy in many programs. Vermont Energy Investment Corporation is developing a tool to operationalize these findings into its program design. In this presentation, I will present on the findings from this study and highlight several key opportunities for program designers and further research.

Author: Rebecca Malfroid, DTE Energy

Paper Title: Improving Customer Satisfaction in Home Energy Report (HER) Programs without Sacrificing Savings

Abstract: Must utilities settle for low program satisfaction in order to achieve savings through Home Energy Report (HER) programs? DTE Energy tackled this question head-on by researching the effects of softening the tone of HER messaging on satisfaction and savings. While HER programs are a positive experience for some customers, encouraging them to conserve and save money on their energy bills, HERs can frustrate inefficient users. Participants who consistently rank poorly in neighbor comparisons may feel that efficiency goals are too difficult to achieve. These customers often report low program satisfaction and may disengage from the program entirely. Between March and December, 2016, approximately 100,000 households with inefficient energy use were assigned to either a "Soft Norm" or "Target Rank" message designed to soften the tone and provide a more positive experience for these customers. Through experimental design, DTE identified the 150,000 most inefficient users in the HER program, assigned 50,000 to each of the alternate messaging regimes, and assigned the remaining 50,000 to a control group who continued to receive status quo messaging. Analysis of the results confirmed with 85% confidence that the alternate messaging increased satisfaction by over five percentage points. Average satisfaction scores among Target Rank and Soft Norms participants were 67.1% and 64.8%, respectively, compared with 58.7% satisfaction among the Baseline group. Moreover, satisfaction gains did not come at the expense of savings. T-tests of the differences in mean savings between groups showed no statistically significant differences. Through the Message Testing experiment, DTE created happier HER participants who saved just as much as their less-satisfied counterparts. These results are of interest to all utilities interested in increasing customer satisfaction with their HER programs without depressing savings.

Author: Gary Swan, Vice President, National Energy Foundation

Paper Title: National Energy Literacy Survey of High School Seniors

Abstract: Energy Efficiency and Energy Literacy: The First National Energy Literacy Survey

By May 2017, the National Energy Foundation (NEF) will have completed the first ever National Survey on Energy Literacy in the U.S. The survey is being administered to 2,000 randomly selected high school seniors, with the objective of finding out what students know (knowledge), feel (attitudes) and are doing (behaviors) about energy and energy efficiency as they complete their K-12 journey. High school seniors have been selected as the target for this survey because of this critical juncture in a student's life where they become voters, possible utility bill payers, college students, and/or members of the full-time workforce.

NEF has seen preliminary data from the survey, and the results are fascinating, particularly as we examine the correlation between knowledge, attitudes and behaviors. For example, if a student scores high on the knowledge portion of the test, how well does that translate to their actions? Additionally, the national sample is stratified for various demographic factors, including family income level, ethnicity, gender, high school GPA, and region of the country. Exploring the differences in energy literacy among these subgroups provides some powerful insights that can help drive new energy efficiency program design for both utilities and government. Another area for insight is the development from the data of energy-related "personas," much like psychographics that are used in product marketing. Specific knowledge categories in the survey include: Basic Energy Concepts, Energy Use, Energy Efficiency & Conservation, Sources & Types of Energy, and Energy Tradeoffs & Implications. Students' responses lead to an overall Energy Literacy Score, scaled on a 1 to 100 point scale. Preliminary data (more than 75% of surveys completed) show a score distribution that follows a typical bell curve, suggesting a well-designed set of questions. A pilot survey to approximately 350 participants was administered in February and March to help refine the final questionnaire.

NEF's survey research partner is Cicero Social Impact, a reputable research group that has worked in partnership with the Clinton Foundation, the Gates Foundation, the George W. Bush Presidential Center, and many other national organizations. NEF believes this is an unprecedented project, and will produce an unprecedented data set that will help inform utility and government planners as they create critical energy efficiency-related regulation and policy for the future.

A formal white paper has been planned, and will be developed and completed by the end of May 2017. NEF will be referencing this white paper, and making it available, as a part of presenting at the BECC conference.

Scaling Up Utilty Program Savings

Moderator: David Jacot, LADWP

Author: Elena Dulys, Data Scientist, Simple Energy

Paper Title: Behavioral Energy Efficiency Programs Also Boost Utility-Branded Marketplace Sales

Abstract: In the context of an evolving energy market and the quest to become utilities of the future, understanding how to optimize demand-size management is crucial for utilities. Energy efficiency programs that span beyond behavioral change into the sale of energy efficient measures are of increased interest in the energy utility industry due to the persistence of savings that the latter offers at a greater cost efficiency. Behavioral energy efficiency programs have become commonplace in the industry and utility-branded marketplaces that sell energy efficiency measures are on the rise.

What happens when a utility offers a marketplace along with a behavioral program? By exploiting multiple randomized control trials spanning two clients, Simple Energy has found evidence to suggest that utility customers exposed to a behavioral energy efficiency program spend more money at utility-branded marketplaces than their control group counterparts. The implications of these data-driven findings are that behavioral programs can also drive consumer behavior that multiplies the effect of the original program and earns revenue for the utility. Additionally, the insights into high-saving subgroups within these experiments will help utilities understand the best way to allocate demand-side management budget dollars to maximize deemed savings.

Author: Josh Schellenberg, Vice President, Nexant

Paper Title: Insights from California's Very Own "Nudge Unit"

Abstract: In 2010, the government of the United Kingdom established a Behavioral Insights Team, which became known as the "Nudge Unit" for its effective application of behavioral science principles, including those described in the 2009 book "Nudge." The seminal 2012 paper for the Nudge Unit, "Test, Learn, Adapt: Developing Public Policy with Randomised Controlled Trials," discusses randomized controlled trials (RCTs) and how they can be used to significantly improve the cost-effectiveness of government policies and services. In California, SoCalGas® has applied this test-learn-adapt process for several years to accelerate the innovation of behavioral conservation programs, working with Nexant as its strategic planning partner. This "Nudge Unit" has uncovered dozens of behavioral program insights by simultaneously testing and iteratively adapting various interventions designed to encourage energy conservation. These large-scale RCTs involving millions of utility customers have conclusively answered several key research questions regarding behavioral conservation programs, including:

- How do the energy savings of an in-house developed bill alert service compare to those of a vendor-provided home energy report?
- How do the energy savings of two different home energy report providers compare?
- Which specific design features of bill alerts and home energy reports drive energy savings?
- How can utilities further leverage advanced meter data to improve behavioral conservation programs?
- Which types of behavioral conservation programs work best underperforming customer segments, including low-income, Spanish-speaking and business customers?

This presentation will cover the insights from these research questions and discuss more broadly how policymakers and program planners can continue to test, learn from and adapt behavioral interventions. Although this presentation focuses on interventions that produce energy savings in the utility sector, the general approach and effective application of behavioral science principles will be of interest to BECC attendees from any sector.

Author: Kate Zerrenner, Manager, Energy-Water Initiatives, Environmental Defense Fund

Paper Title: Designing Better Energy And Water Programs By Understanding The Nexus At The Residential Level

Abstract: Energy and water are both basic components of life and economic progress, and they are inextricably linked. Energy is used to secure, deliver, treat, and distribute water, while water is used (and often degraded) to develop, process, and deliver energy. Energy and water policies at both the federal and state levels were developed to support traditional central thermal power plants that are both highly water- and energy-intensive processes, and traditional utility business models are not aimed at promoting efficiency.

First-of-its-kind research undertaken by Pecan Street, Inc for EDF quantified the embedded energy in water use and the embedded water in energy use for Austin households in 2016. Through custom water measurement hardware coupled with electric smart meters, the project used data collected to model at the residential level, how much energy is used for various water-related activities (ex. taking a shower, running a sprinkler or irrigation system, running a clothes dryer, etc.), and how much water is used to provide energy for common electricity activities like running an air conditioner, running a clothes dryer, and similar activities. In 2017, the second phase of the project doubled its sample size to validate and refine the water disaggregation algorithms so that they can become a consensus approach that utilities adopt to calculating total energy and water conservation potential. This work is now being developed to develop an energy and water savings evaluation methodology to determine the comprehensive conservation benefits of end use devices.

This evaluation methodology could form the basis of a certification program for water- and energy-saving technologies that accounts for the embedded energy in water use and the embedded water in energy use. Such a certification program would make it possible for electric utilities to structure programs to offer rebates for devices that are focused on water conservation, such as irrigation control systems, that also potentially provide a significant embedded energy savings. The evidence further shows that when consumers are aware of the water associated with energy use and the energy associated with water use, they are more likely to conserve both. With this data, utilities could structure programs that aim for more comprehensive energy and water savings, including targeted conservation programs. This presentation will present the data findings from the project and lay out some potential program development options for both electric and water utilities to maximize both rebates and incentives and increase savings in both energy and water sectors.

Author: Mark Hand, PhD Student, LBJ School of Public Affairs

Paper Title: Learning In Renewable Energy Ecosystems: A Knowledge Network Study

Abstract: Mark C. Hand, Ariane L. Beck, Xue Gao, Varun Rai LBJ School of Public Affairs, The University of Texas at Austin

Solar energy is broadly accepted as a key technology in reducing greenhouse gas emissions, improving air quality, and potentially improving electric grid resilience through distributed generation and storage resources. For solar photovoltaic (PV) hardware costs have rapidly declined over the last decade. But PV installation soft costs – including regulatory, financing, customer acquisition, permitting and inspection, and labor costs – remain substantially higher in the U.S. than in countries such as Germany, China and Australia. Understanding how PV installers learn, acquire, and implement knowledge about these soft costs will help unlock the pathways to lower soft costs, thereby encouraging further PV growth. To build a deeper understanding of how these knowledge flows impact solar soft costs, we explore the following question: Who learns what (knowledge acquisition), from whom (knowledge production), and how (spillover mechanisms)?

We address this question by mapping the ecosystem of residential PV installers in Austin, Texas. Austin is home to Austin Energy, one of the nation's leading municipal utilities in encouraging PV adoption, which it began pushing for in the 1990s, first through its own solar projects and then through solar rebates and more recently through value-of-solar tariffs. Building upon the scholarly literature on knowledge networks and organizational learning, we construct the knowledge network of the Austin solar installation ecosystem by interviewing and surveying the employers (N ~ 75) and employees (N ~ 500) in the ecosystem. The primary connections (edges) in our network are learning flows: How do solar installers make decisions about which networks they must develop to learn what they need to run their companies? What knowledge do they decide to integrate into their organizations? Through analyzing this network, we gather insights on how knowledge networks evolve, how the drive for information shapes networks, and how network characteristics influence soft costs.

Ultimately, such understanding of how installers learn, produce knowledge, and act on that knowledge will result in more effective policies and practices to support the growth of effective knowledge networks and spur innovation that further reduces the cost of solar, accelerating the deployment and increasing the accessibility of solar PV. Additionally, our analysis offers insights beyond the solar industry, providing guidance for how programs can contribute to the development and fast tracking of other innovative industries that involve learning at multiple scales. This research is part of a larger, multi-institution project on "Knowledge Spillovers and Cost Reductions in Solar Soft Costs" funded by the Solar Energy Evolution and Diffusion Studies (SEEDS-2) program under the U.S. Department of Energy's SunShot Initiative.

Rate Design

Moderator: TBD

Author: TBD, American Council for an Energy-Efficienct Economy

Paper Title: Intersection of Energy Efficiency and Residential Rate Design

Abstract: Residential electric rates are in a period of change. Utilities in many regions of the country are experiencing flattening and declining electric sales. At the same time, technological changes are driving increased deployment of advanced metering, electric vehicles, and residential rooftop solar. All of these changes are driving utilities to propose new rate designs for residential customers that depart significantly from previous offerings. Proposals including higher customer charges, demand charges, and time varying rates are all on the rise. This report explores how these changes in residential electric rates may alter customer behavior and engagement in energy efficiency programs.

Within this research effort, we seek to answer the following questions:

- What effect do various rate structures have on overall consumption of electricity?
- What effect will recently proposed changes in rate design have on payback of various energy efficiency measures?
- What are the implications of various rate design options for low-income customers?

To answer these questions, we review several recent pricing studies and pilots measuring customer response to different electric pricing options. Within these studies, we focus on changes in peak demand and overall consumption, but also present other relevant findings including customer satisfaction and enrollment patterns. Many of the pricing studies and pilots also attempt to segment populations by income level, offering insights into how low income populations respond to changes in electric rates.

We also present an analysis on how various rate design proposals could alter payback periods for residential energy efficiency measures. To do this, we rely on a load research sample from an Arizona utility and data from the Arizona Public Service Technical Resource Manual, including peak demand reduction, annual energy savings, and incremental cost of the energy efficiency measure. We modeled this data to collect payback periods (in years) for 14 energy efficiency measures under 20 different revenue neutral rate design options.

Author: Gomathi Sadhasivan, DNV GL

Paper Title: The Costs Of Convenience – Do Auto Pay And Budget Bill Options Lead To Higher Energy Bills?

Abstract: Recent research by Duke University found that residential customers of a Southeastern utility who were enrolled in auto bill pay (ABP) used 4% more energy than their peers. The study also found that low income customers enrolled in a budget billing (BB) program designed to smooth seasonal bill extremes increased their consumption by 6.7%. The results from the Duke paper imply that the absence of a bill reminder/price signal may make customers more likely to consume more energy.

ABP programs offer customers the convenience of automating a recurring transaction, minimizing/eliminating late payments, and a reduced transaction burden related to bill payment. Budget billing (BB) programs allows customers (especially those with fixed incomes) to better manage their bills by eliminating seasonal spikes by spreading their bills over the course of a year through a flat monthly rate that is determined from past usage and bills. Moving customers to ABP and BB enables utilities to better manage payments owed to them by reducing the number of customers with a late payment or non-payment and the labor hours required to manage bill payments through non-automated options.

This paper will discuss the findings from a study that evaluated the effect of ABP/BB on residential customer energy consumption in California, using results from an ongoing Home Energy Reports (HER) program to assess the joint effect of HER and ABP enrollment on energy consumption. This paper offers an extension of the published research to compare effects of ABP and BB on customers with and without Home Energy Reports.

This paper will explore the impacts of price and information salience in opt-in ABP/BB and opt-out HER programs. Questions explored will include: 1) how do non-participants and participants in either program stay apprised of their bill information, 2) how many HER control group participants in ABP/BB continue to actively review their bill? 3) how do varying levels of self-reported awareness of bill amount and consumption correlate with observed impact from dual (ABP/HER) program participation? 4) What are the demographic characteristics of customers who choose the various bill-pay options? 5) Can the IOUs use these characteristics for targeting education/marketing? This paper will contribute empirical evidence to an important new area of investigation that explores the unintended impacts of automation and customer convenience on energy consumption. Findings from this research are relevant to utilities, regulators, and consumer advocates.

Author: Nat Treadway, Managing Partner, DEFG

Paper Title: Behavioral Drivers of Prepaid Electric Service

Abstract: The presentation identifies five "C's" that help to understand the behavioral drivers associated with prepaid electric service: communications, currency, commitment, clarity and choice. The audience will begin to appreciate electricity prepayment as a smart-grid offering, and understand how the behavioral lessons of prepayment may improve customer engagement and the design of energy efficiency programs. Numerous public power utilities and member-owned electric cooperatives offer voluntary prepayment because they cannot justify cross-subsidies for customers who do not pay bills. Prepayment reduces debt because service is disconnected as soon as the customer's account balance reaches zero. Many customers are happy with prepayment because they avoid a security deposit, they avoid surprise utility bills they cannot pay, they have easy access to their account balance, they pay whatever amount they are able whenever they want to (it suits their lifestyle), and they feel a sense of control. Customer satisfaction increases; energy waste is reduced. Prepaid electric service is beginning to gain favor among executives at investor-owned utilities. DEFG's Prepay Energy Working Group, created in 2010, has been studying customer behavior and attitudes. In a recent national survey, 28% of 18 to 34 year olds indicated they would be extremely or very interested in a voluntary prepayment program. With advanced meters and communications, prepay customers get timely and relevant information and they take greater control of their usage. The daily flow of cost information increases awareness of family behaviors that drive daily usage. Armed with information, consumers become engaged, and presumably do a better job investigating and modifying behavior. Conservation savings of 10% to 15% have been verified. This presentation will address customer communications, mobility, convenience, lifestyle and the practical implications of communicating about daily energy transactions in dollars and cents.

Feedback

Moderator: Sharyn Barata, Opinion Dynamics

Author: Kelly Kuehn, Senior Products and Services Manager, Duke Energy

Paper Title: Engage and Expand: How to Keep Home Energy Report Programs Fresh and Impactful

Abstract: More than 5 years since launching its MyHER program, Duke Energy sees continued success and savings due to its emphasis on expanding the program to all populations and keeping customers engaged with targeted content. Duke Energy MyHER customers have saved more than 1 TwH of energy since the program's inception, and are on target to hit 2 TwH in 2018. These accomplishments wouldn't be possible without constantly enhancing the program to ensure the best results.

Last year, Duke Energy expanded upon its successful single-family home strategy by being one of the first utility companies in the country to offer home energy reports specifically created for multi-family homes. While nearly 60% of the US population resides in a multi-family home, the transient nature of the residences combined with the unique features of a multi-family home have made these customers typically hard to treat. To combat this, Duke segmented customers living in a multi-family home to make certain they receive proper comparisons to similar homes, as well as ensuring they receive content and tips created solely for their living situations.

Duke Energy has continued its focus on ensuring customers receive the right information in the right way to keep them engaged in the long-term. A key component of this has been consistently changing content and keeping it fresh, as well as working to bring more people to the online portal, MyHER Interactive. Another aspect is to offer new challenges to customers and continue their engagement with saving energy from year-to-year. This has resulted in an industry high open rate for emails of 41% and a very low opt out rate. Duke Energy works to properly cluster its neighborhoods to make sure that recipients receive the right comparison to the right houses, making the comparisons feel appropriate and more actionable.

In keeping with Duke Energy's effort to keep their My Home Energy Report fresh and relevant, the team will be rolling out a dual fuel report for their customers in Ohio and Kentucky that receive their electricity and gas from Duke Energy in the fall of 2017. Duke Energy also offers an extremely successful High Bill Alert program to eligible customers, which help alert customers to higher than expected usage and ways to cut costs and refers customers to MyHER Interactive to learn ways to save

This presentation will highlight these successes of the MyHER program to outline strategies for other utilities to keep their customers engaged over the long term, including how to treat different segments of the population and how to tailor content to customers at the right times.

Motivating Residential Behavior

Moderator: Derek Okada, SCE

Author: Mark Martinez, Senior Portfolio Manager, Southern California Edison

Paper Title: Making It Personal – Aligning Customer Wants and Needs with the Universal Loading Order of Integrated Demand Side Management

Abstract: Programs and markets naturally self select themselves into singular and specialized value propositions to maximize consumers' adoption of new products and services. This specialization is common in demand side management programs that are provided by the utilities with a unique difference: demand side management specialization is drive by energy resource demands, not customer preferences, creating a chasm between what the customers will accept and what utilities are pushing to market.

With "siloed" offerings driven by separate regulatory proceedings, funding sources, and ultimately, separate utility departments, the DSM market is highly specialized and compartmentalized for all the wrong reasons. Customers are marketed energy efficiency (EE) first, and maybe some discussion of demand response (DR), with a bit of conservation or distributed generation (DG) on the side, and usually through distinct campaigns and with often redundant demands of the customer. Every program stays in their own swim lane.

However customers have their own expectations. Research has shown that customers have their own preferential loading order for improvements in their business or home, and it could be getting as renewable as possible first (DG), then some low risk and low cost incentive program (DR), then perhaps an investment in new equipment (EE) from the savings and revenue for participation in these "gateway" programs. That's not what the utilities expected. This paper will outline the need states of mass market customers by drawing on the learnings of recent integrated demand side management (IDSM) pilots conducted by several utilities. The outcomes are revealing, and show the customer-centric path forward. Through this work, we will examine how IDSM information can be driven to better align with customers' preferences. For example, the research suggests that a comprehensive program with a clear, behavior -based entry point and with joint EE/DR/DG messaging can serve as a catalyst to drive continuous engagement with customers, via integrated and personalized offerings. This is one of many examples that will be developed by drawing on several case studies and exploring how they examined the barriers to adoption. The paper will also outline a set of recommendations grounded in behavior change theories to provide policy guidance for how utilities can effectively address an awaiting and eager mass market customer base.