



POLICY AND PLANNING DIVISION

Customers as Grid Participants: A Fundamentally New Role for Customers

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I. EXECUTIVE SUMMARY

The emission reduction goals called for in The Global Warming Solutions Act of 2006 (AB32) are challenging. The electricity sector's role in reaching those goals is paramount, as the state indicates that it is the largest potential source of viable emissions reductions. The California Public Utilities Commission (CPUC), along with its sister agencies under the leadership from the Governor and the legislature, have laid out a number of policy initiatives and programs to reduce greenhouse gases. These strategies include increasing the deployment of renewable powered distributed generation, promulgating electric cars, deploying smart meters, increasing the penetration of both commercial and residential energy efficiency and defining the market for Zero Net Energy homes.

Each of the above strategies is dependent on customer action. Customer participation, more than the actions of the utilities or of the regulators, is critical to meet California's greenhouse gas emission goals in a cost-effective manner.

Regardless of the underlying motivation, the customer's participation is critical to achieve these emissions reductions goals. Customer participation is the key; they have become an integral part of the power supply chain and of the grid itself. This is a paradigm shift from the historical view of utility consumers as merely ratepayers and passive recipients of electricity services to active participants in the power grid. In fact, this energy future represents a fundamental change in the relationship between the utility and the customer, increasing the onus on both to become partners.

Customer engagement is crucial to successful navigation of the paradigm shift. Getting customers engaged should be one of the primary goals of the utilities and the regulators. Engagement with the utilities and the third party service providers will expose customers to opportunities and tools to help them manage their energy usage for their optimal comfort and finances. To help understand the current level of engagement, this paper reviews three recent studies on customer segmentation that are relevant to the energy space.

Two primary actions that the utilities and regulators should consider are:

- Prioritize customer engagement through program designs and service offerings using analysis of customer needs and motivations.
- Expand the service offerings of the utility to include services that will facilitate and automate the customers' energy management opportunities.

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II. INTRODUCTION

In 2006, California passed historic legislation (AB32)¹ to curb the emission of carbon dioxide and other greenhouse gases (GHG) in the state and bring total GHG emission levels back to 1990 levels by 2020. This goal represents a decrease in GHG emissions of approximately 25%.

Meeting the AB32 Climate Solutions Act emission reduction goals will require a number of monumental changes for the electricity sector. In addition to aggressively increasing both the energy efficiency and customer-generated renewables goals, it will also require the updating or “smartening” of the grid infrastructure and communications, as well as the electrification of the transportation sector which includes transitioning people to electric cars. To put these goals in context, it is useful to understand just how much more aggressive the program goals are in a post-AB32 California, including the goals incorporated by the California Air Resources Board (CARB) Scoping Plan and those required through legislation, executive order, or agency goals:

Energy Efficiency: Prior to AB32, the goal was to offset 50% of new demand through energy efficiency, thereby slowing the demand growth and avoiding the need for new power plants. Post AB32, the targets are much more aggressive. For example, The California Energy Efficiency Strategic Plan² (EESP) calls for 100% of existing homes to reduce their load by a minimum of 40% by 2020 (and 25% to reduce their energy by 70%), and for all new homes to be Zero Net Energy (ZNE), or produce as much renewable energy on-site as they need to meet their demand.

Customer-Scale Renewables: Prior to AB32, The California Solar Initiative (CSI) called for the installation of 3,000 MW of new solar. Post AB32, an additional 4,000 MW³ will be needed to meet the “Big Bold” Goal in the EESP that every new home should be built to be a ZNE building by 2020.

Electric Cars: Prior to AB32, CARB had called for 15.4% of new car sales to be Zero Emission Vehicles (ZEV) by 2025. Car makers will now be required to find a way to entice car buyers to ramp up from a total of 7,500 ZEVs sold per year currently to more than 250,000 by 2025.

While increasing building codes and appliance standards will assist in the process of transforming the markets to achieve these goals, the success of each of these policy and infrastructure changes are heavily reliant on the customer’s participation. Customers will be expected to adopt new technologies and behaviors. Even with though there will be many policy levers, the success of the AB32 goals will still be reliant on a significant number of customers buying highly efficient products and using them in an efficient way, such as buying electric cars and charging them at off-peak hours and buying smart-grid integrated appliances that are run mainly at off peak hours when the market sends an optimal price signal. Customers are not only the key to our energy efficiency goals, but also to our renewable, smart grid, and transportation electrification goals. This elevation of the customer role is a paradigm shift from

¹ AB32 is the California Climate Solutions Act.

² The California Energy Efficiency Strategic Plan is available at www.CaliforniaEnergyEfficiency.com. It is currently being updated and some goal results may change.

³ Figure from a recent HescongMahone/E3 report on Zero Net Energy Roadmap released December 2012.

the historical view of utility consumers as merely ratepayers and passive recipients of electricity services to active participants in the power grid. In fact, this energy future represents a fundamental change in the relationship between the utility and the customer, increasing the onus on both to become partners.

Many experts in the smart grid community have acknowledged this paradigm shift and are actively seeking ways to better understand how to navigate this new challenge. In a recent report by J.D. Power, they stated: “The US electric utility industry faces multiple challenges in enlisting their energy customers as smart grid participants. The industry’s goal is to enable customer involvement in optimizing when, where, and how much electricity they consume, generate and store. Fundamentally, this requires a new definition of customers’ role in the power supply chain, predicated on encouraging smart energy behaviors unfamiliar to many of them.”⁴ Not all market transformation will come directly from customer actions. In fact, much of it will come from improved building codes and appliance standards and other policy interventions. Still other efficiency improvements will come from technologies that have yet to be invented. Nevertheless, as an “integral part of the grid,” the customer’s actions and decisions will have a more direct impact on grid function.

The following are just some of challenges facing the residential customer base as a result of new policy initiatives:

Zero Net Energy (ZNE) homes could be required by code – California’s Energy Efficiency Strategic Plan⁵ calls for all new homes to produce as much onsite renewable energy as they use by 2020. If enacted, this code-enforced requirement will likely cost customers more upfront for a new home, while offering reduced utility bills over its lifetime. To maximize the benefits, customers should also learn how to “operate” their home so that the amount of energy they use is equal to the amount of energy they produce in order to achieve a net zero goal and to pay back the investment they have made in a reasonable timeframe.

Demand Response is needed to shave peak demand– In order to reduce peak demand, utilities and regulators are urging customers to think about what impact their personal energy usage has on the grid, by offering customers an incentive payment to participate in programs that use less power at peak times and to consider giving up a small amount of comfort and control in return for financial benefits.

Rate structures are changing – In an effort to encourage energy efficiency and curb peak power demand, California is considering moving to an electricity rate structure based on the time of day a customer uses electricity.⁶ In fact, all three IOUs already offer time of use rates to customers who have a smart meter installed. These rate structures encourage customers to evaluate not just *how much* energy they use, but *when* they use it.

⁴ JD Power “2011 Smart Energy Consumer Behavioral Segmentation Study”, page1.

⁵ California’s Energy Efficiency Strategic Plan, issued in September 2008 by the California Public Utilities Commission, sets out a roadmap for energy efficiency in California through 2020. For more info to go to www.CaliforniaEnergyEfficiency.com.

⁶ Time of use rates change depending on the time of day.

Data is becoming abundant – Between the internet, the smart meter, in-home devices, and even smart phone apps, the amount of energy usage and production data available to customers is significant. Likewise, there are significant possibilities for leveraging the data via the third party market to enhance energy management services to customers.

Utility programs offer whole-house oriented options – Some new utility programs are designed to make people think about the energy performance of their whole house, not just about the appliances or “widgets” in the house. This approach relies on the customer to be willing to be more educated on the inner-workings of their home’s systems and to invest in the upgrading of those systems.

Choices for sources of electricity are increasing – The utility is not the only provider of electricity anymore. Whether it is purchasing or leasing a solar system in order to produce their own power or joining a Community Choice Aggregator ⁷ (CCA) in order to support the CCA’s individual goals of green or local power, customers have more choices of where to get their power. Each choice, however, has both costs and benefits that must be researched and weighed carefully by the customer.

Electric vehicles are becoming a viable choice – A host of new car options offer customers the ability to eliminate their fuel costs by purchasing a new type of car. With the new car will also come the purchase a new type of fuel, a new place to fuel (including their homes), and a new time to fuel -- nighttime.

Each of these customer challenges is a result of policy initiatives designed to encourage the customer to rethink their relationship with energy usage and their utility. The customer is encouraged to adopt new behaviors and invest in new technologies from new thermostats and refrigerators to new solar photovoltaic (PV) systems and electric cars. The question is: Is it a realistic expectation for California to assume that customers will be ready to embrace the paradigm-shifting new role facing them? Will they embrace the opportunity to be more knowledgeable, engaged, and disciplined than ever before and will they find the means and have the desire to invest in new technologies on the scale that is required?

This question prompts another question: What does a customer ready to embrace a paradigm change act like? Much of the discussion around customer participation in the grid currently centers on the concept of customers becoming “smart customers” and/or taking on the role of “energy managers” in their own homes. Each “smart customer” or “home energy manager” would know what energy is being used when and by what; he would know what investments to make to use less energy or incur less cost; he would have an automated control system that allows optimal operation of the home systems and appliances; and he would have the information to consider producing his own on-site energy.

⁷ Community Choice Aggregation is a system (neither a company nor an organization) adopted into law in California which allows cities and counties to aggregate the buying power of individual customers within a defined jurisdiction in order to secure alternative energy supply contracts.

This notion of an “energy manager” in every home may seem an extreme notion, and to some an unrealistic goal. But in reality, these are the questions that households are already being asked and for which programs are already being developed. All a “smart customer” would need to do, in theory, is participate in programs that already exist or will in the near future, many of which will help automate the energy manager’s job.

To answer the question of how ready California customers are to embrace the new paradigm, we looked at a number of recent studies on current customer behaviors, attitudes and participation in utility programs. The studies, which also grouped like-minded customers into customer segments, revealed which customer segments are currently participating in utility programs, as well as the motivations and barriers to their participation based on the personality of those segments. Understanding the current behaviors and attitudes of various customer segments will allow us to better understand who our customers are and what is driving their decisions in order to extrapolate how they will react to future programs and outreach and how likely they are to embrace their new role.

III. CUSTOMER SEGMENTATION

The utilities and the energy community at large are conducting and refining their customer research efforts through the development of customer segments in order to better understand exactly what customers’ attitudes and behaviors are when it comes to customer-oriented programs. For our research, we used both utility data and research conducted by the industry.

a. Overview of Segmentation

Customer segmentation is the effort of assembling customers into distinct groups with similar characteristics, behaviors, or attitudes. It is an analytical tool that has been in use for decades by many different industries to market specific products to specific customer groups. The utilities began using segmentation methods in the 1980s to more effectively market their energy efficiency programs. Recently, the utilities have gravitated from demographic classifications, which groups customers according to their similar race, gender, or age to “lifestyle” segmentation, which focuses more on grouping customers based on similarities in their decision-making frameworks. This segmentation approach provides richer information not only on *what* a customer did, but more importantly, *why*.

Much has been written about the effectiveness of customer segmentation. As Loren Lutzenhiser wrote in his CIEE paper, *Behavioral Assumptions Underlying California Residential Sector Energy Efficiency Programs*, “What detailed lifestyle customer segmentation might do best is to help to combat the tendency of planners to think in the abstract model of rational, context-less decision making.”⁸ In other words, the customer segment information can help planners create products and services that are based on actual customer preferences and behaviors. Yet, Lutzenhiser points out that while there is value in conducting and utilizing these studies, “customer segmentation results may often be more artistic than scientific.”⁹ Indeed, in looking at the results for any of the segments created, it is clear that

⁸ *ibid*

⁹ *Behavioral Assumptions Underlying California Residential Sector Energy Efficiency Programs*, page 53.

no segment represents an entirely homogenous group, but rather a group of people who act similarly and the majority of whom share some significant traits.

Nevertheless, a close examination of these customer segments provides significant context to the discussion of how to best match up the energy efficiency, renewable and smart grid programs in California with the needs and desires of the customer base primarily because they help personalize the customers. In fact, while customer segmentation was created as a tool to help with marketing outreach, an overlooked opportunity of customer segmentation is designing and evaluating successful program offerings, products and services, not just slogans to market them (i.e. Customer segmentation data and analysis can result in better forecasts of technology adoption by early adopters, and a better understanding of the relevant price points for products/services).

b. Segmentation Studies

Over the past several years, there have been numerous efforts to segment utility customers. Below we provide an overview of three recent efforts. The first is a study by Opinion Dynamics, a market research and evaluation company in Oakland, CA, that looks at California customers as a whole. The second is from J.D. Power, a global marketing information services company that looks at both the California and the national utility sector customer bases, and the third is a Pacific Gas & Electric (PG&E) study that looks only at its own customer base. All three studies are focused on utility programs and do not consider other types of programs. The J.D. Power and the Opinion Dynamics study are both survey based studies, and so while they cannot be used for evaluation purposes, they are a good indicator of the customer's behaviors and attitudes. The PG&E study is based on actual customer participation, not on surveys.

i. Opinion Dynamics

In April 2009, Opinion Dynamics presented its report¹⁰ on a statewide ethnographic study and segmentation project conducted as an extension of their evaluation work on the Statewide Marketing, Education and Outreach (SWME&O) programs. This work was conducted to support future SWME&O programs and is being used for Energy Upgrade California.

The main focus of this study was on energy efficiency utility programs. In addition to behavioral energy-usage traits and attitudes, the customers were divided into segments based on demographic information on age, household size, geographic location, race, education and any other characteristics that researchers could find that overlapped within the customer groups.

Opinion Dynamics found five distinct segments or personalities, each of which demonstrated significant opportunities and challenges to adopting energy efficient behaviors based on their attitudes, knowledge or financial limitations. Below are the five segments and descriptions of their personalities and challenges:

1. **Leading Achiever (20%)** - homeowners that skew older as well as racially whiter than any other group. This group is affluent, highly educated, resource-minded, and indexes high on energy-

¹⁰ Opinion Dynamics Final Segmentation Report_121009

related altruism. While they also index high on energy efficient purchases, they do not index high on energy conservation, thinking they are already doing all they can.

2. **Practical Spender (18%)** - homeowners who are likely to be older, ethnically diverse, lower income, and high school educated. While they index the highest on energy efficiency purchases and have a high energy bill, they are primarily motivated by convenience and comfort and do not conserve energy nor feel an obligation to.
3. **Striving Believer (24%)** - highly educated, young, urban renters with middle incomes who would like to reduce their energy usage, but are very busy and, as renters, do not feel they are empowered to take action.
4. **Thrifty Conserver (21%)** - low-income renters who skew towards either end of the age spectrum, with low concern for conserving resources and an unwillingness to give up comfort, who feel their actions will have little to no impact anyway, but are interested in saving money.
5. **Disconnected (17%)** – young, ethnically diverse, low income, high-school educated renters, with limited income to spend on energy efficiency, and for whom energy efficient products appear to be substandard.

Opinion Dynamics conducted an extensive survey of their respondents not only in terms of their beliefs and attitudes, but also in terms of their behaviors and their level of engagement with their utility. “Engagement” is a broad term which can be used to describe a customer’s participation level in utility programs such as rebates or bill assistance programs. However, it can also be used to describe their willingness to engage in communications with the utility, including openness to marketing messages or a willingness to contact the utility for information or assistance. In the table below, we tabulated some of the energy-related behaviors and levels of engagement of customers surveyed in the Opinion Dynamics study. The numbers represent the percentage of each segment that exhibits the behaviors or engages in the programs listed in the table.

Table 1. Behaviors and Engagement of Opinion Dynamics Segments

	Leading Achievers	Practical Spenders	Striving Believers	Thrifty Conservers	Disconnected
Behaviors					
Recycles	90%	n/a	83	68	65
Turns off lights	90%	81	88	87	74
Unplugs Electronics	33%	34	42	52	39
Engagement					
IOU Programs	38%	35	19	20	16
DR Alerts	36%	27	9	9	7
Energy Audit	27%	19	4	6	2
Solar Panels	9%	6	7	6	11
High Cost Purchases					
EE Large Appliance	94%	91	74	78	37
EE HVAC	81%	74	69	65	21
Double-Paned Windows	76%	70	48	55	30
Low Cost Purchases					
CFLs	61%	56	45	40	35
Low Flow Showerheads	84%	78	59	59	31
Programmable Thermostat	81%	71	40	29	21
Income Levels					
< \$49,000	32%	53	39	60	75
< \$75,000	47%	78	56	74	83

It is evident from the table that all five segments have an extremely strong tendency for recycling and turning off lights when they leave a room. While these are considered “environmentally friendly” behaviors, they are also considered to be the social norm, so it is not surprising that all five segments showed such high participation. Nevertheless, the levels of environmental behavior are affected by the segment bias towards environmental issues. For example, while all of the segments demonstrated strong tendencies for recycling, the most environmentally-aware segment, “The Leading Achievers” recycles at a significantly higher rate than their counterparts, with 90% of this group recycling. Not surprisingly, “The Disconnected” segment has the lowest recycling rate with only 65% of the segment recycling. When looking at the relatively new conservation behavior of unplugging electronics when leaving the room to avoid “vampire load,” participation in that behavior is significantly lower in every segment, with only the segment most concerned about saving money (“The Thrifty Conservers”) showing participation above 50%. Interestingly, the two segments that recycle the most (“The Leading Achievers” and the “The Striving Believers”) showed the lowest tendency to unplug their electronics, but this may be because the behavior is perceived more as a money-saving action than an environmentally responsible action.

The table also demonstrates that engagement in utility programs is highly differentiated between the homeowner segments and the renter segments, with the two homeowner segments (“The Leading Achiever” and “The Practical Spenders”) showing significantly higher participation in virtually all IOU programs, especially for home energy audits and demand response programs. This should be expected as both of the programs are geared for home owners. Both homeowner groups also demonstrated a high propensity to purchase both high cost and low cost efficiency appliances and equipment. This parity in energy efficiency action is noteworthy given their differing fundamental motivations. While the “Leading Achievers” are energy altruists and considered to be the “state’s potential energy evangelists,” the “Practical Spenders” are more driven by convenience and comfort. It is also interesting that both segments indexed very highly on energy efficient actions that they would take, and yet by comparison, their engagement with the utilities is much lower. Further analysis would be required to understand if they are acting in a strong conservation manner through both their purchases and their behaviors, but are doing so outside of IOU programs, or whether they have high conservation inclinations, but are not executing on them.

It is also useful to compare “Practical Spenders” with “Thrifty Conservers,” as both share a conservative cost-conscious attitude. The study found that the home-owning “Practical Spenders” out-purchased the “Thrifty Conserver” renters in each category, both the categories related to homeownership such as large appliances, as well as those items that a non-homeowner would purchase, such as light bulbs. Conversely, the “Thrifty Conservers” outperformed the “Practical Spenders” in almost every behavioral category.

Similarly, home-owning “Leading Achievers” share a similar liberal leaning eco-conscious attitude with “Striving Believers.” In a similar scenario to their more conservative brethren, the renting “Striving Believers” outperformed the home-owning “Leading Achievers” by a slight margin in terms of conservation practices, but underperformed in comparison when it came to more energy efficient investments.

Given that the lower-income “Practical Spenders” were also more inclined to embrace conservation actions more than their higher income home-owning counterparts in the “Leading Achievers” group, this trend prompts the question: Are the lower-income renters, who appear to be actively looking for ways to save energy and money, seeking to do so through change of behavior versus purchases of energy efficient products because they have a renter’s mindset that inhibits the purchase of any item that could be seen as an investment in efficiency even if it has a direct benefit to them through a reduced utility bill, or whether their lower income levels prevent them from making these purchases, or both. Additional analysis, as well as data from the Behavioral Programs recently implemented by the IOUs may provide additional insight and actual savings data. The trend also prompts the question of why the home-owners are willing to purchase energy efficiency equipment, but are not as willing to engage in conservation behavior.

The survey conducted by Opinion Dynamics also revealed the income ranges of the customers in the five segments. This information is very useful when looking at what level of investment customers are able to afford. According to the survey, 75% of “Disconnected” earn less than \$49,999, as do 60% of “Thrifty

Conservers” and 53% of “Practical Spenders.” An overwhelming percentage of every segment except “Leading Achievers” earns less than \$75,000¹¹. With the upfront capital requirements of many efficiency, smart grid, renewable, and electric vehicle technologies, these lower income ranges could prove to be a challenge for many customers. Increasing numbers of financing programs including on-bill financing would certainly help, but cost may still be a challenge for a significant number of customers.

Finally, this study was a self-reported study, with many of the questions beginning with “have you ever purchased/done....?” The nature of self-reported data lends itself to higher instances of actions being reported and given that there were no specific time frames included in the question, these answers also represent a time range that could be as much as 20 years. Further, many consumers currently believe that any new appliance is equated with an energy efficient appliance, and consequently, would report any new purchase as an energy efficient action. Therefore, this survey data is most useful when looked at relationally. For example, the differential between the 94% of “Leading Achievers” who reported the purchase of an energy efficient appliance versus the 61% who reported the purchase of CFLs is a significant delta. Likewise, there is a significant delta between the 80% average participation of the “Leading Achievers” across all purchase decisions versus their levels of participation in utility programs which averages 33%.

ii. J.D. Power Smart Energy Consumer Study

J.D. Power recently conducted a national segmentation study entitled, “2011 Smart Energy Consumer Behavioral Segmentation Study”¹² in order to segment the electric residential customer population according to both their current and future energy usage behavior patterns. The smart grid sector of the utility industry has been on the forefront of identifying the customer’s new role in the operation of the grid. Noting that the optimal operation of the smart grid “requires a new definition of the customers role in the power supply chain, predicated on encouraging smart energy behaviors unfamiliar to many of them,”¹³ this study is the first of many steps J.D. Power is taking to find out if the customers are ready to embrace that role and what utilities might do to assist them. The smart grid sector of the utility industry is particularly interested in understanding how customers are using energy today to better predict the likelihood of those customers to engage in “energy management” behaviors in the future. “Energy management” is the term applied to the collection of actions that customers would take to optimize when, where, and how much electricity they consume, generate and store. The study identified six distinct segments of customers based on their energy activities and the degree of control they indicated they would undertake to manage energy cost and environmental impact. The customers ranged from those who outright rejected smart energy management behaviors and engagement with the utility (“Indifferent”), to customers willing to embrace both new technology and new behaviors (“Innovator”). The combined segmentation results nationally were virtually identical to the California utilities that participated in the study¹⁴.

¹¹ \$75,000 has been the income level cited as necessary to be able to afford major home energy upgrades in the California Energy Upgrade Whole House Program

¹² 2011 Smart Energy Consumer Behavioral Segmentation Study is available at: www.businesscenter.j.d.power.com

¹³ Ibid, page 1

¹⁴ California Segment results: Indifferent: 9%; Novice: 15%, Control: 18%, Opportunistic: 30%; Automate: 14%, Innovator: 14%.

The table below highlights what the six segments are, their percentage of the population, the actions they are willing to take, and their barriers to participation. The study also ranked the segments according to their stage of engagement or “readiness” to respond favorably to smart energy program offerings based on psychographic profiling and self-reported behaviors.

Table 2. J.D. Power Smart Energy Behavioral Segments

Segment	Estimated % of Population	Actions	Stage of Engagement	Preferred Rate Plan	Barriers to Participation
Indifferent	9%	Will not take actions	Pre-Active	Flat Rate	Are generally not interested in cost savings or environmental benefits
Novice	17%	Will take no-cost actions (such as lowering the water heater temperature)	Pre-Active	Flat Rate Plus Rebate	Are interested in saving money but do not know what to do and therefore are currently not taking action
Control	21%	Will use thermostat to optimize comfort, electricity usage and bill size	Contemplating	Flat Rate Plus Rebate	Are willing to turn down thermostat to save money, but are not willing to take other actions
Opportunistic	29%	Will take low cost measures (such as installing CFLs) that add up to savings	Contemplating	Time of Day	Are willing to conserve energy through actions, but are not willing to invest in "high-dollar" appliances and equipment
Automate	13%	Will authorize utility to remotely manage energy usage in exchange for savings	Active	Set and Forget It	Are willing to allow the utilities remote access to thermostat, but are not willing to manage their own usage
Innovator	11%	Will invest in high-efficiency new appliances and solar; already taking similar actions	Pro-Active	Flat Rate Plus Rebate	Will invest in "big-ticket" items including solar that yield significant savings, but are less willing to change behavior and feel they've already done all they can

On the positive side, the study found that five of the six segments are willing to take some action (every segment except “Indifferent”). However, as the table above highlights, most of the actions are of the no-cost, no inconvenience type. The “Indifferent” and the “Novice” groups are taking no actions either from lack of interest or lack of knowledge; the “Control” and “Opportunistic” segments are willing to make minor adjustments to their thermostats and install CFL’s, but are not willing to go further; and the “Automate” and “Innovator” are willing to invest in new technologies, but are less willing to engage in conservation behavior. Four of the six segments, or 76% of customers, are not willing to invest in energy efficient appliances and equipment, and are considered either “pre-active” or contemplating action.

Interestingly, the study found that all segments were motivated by cost savings and the environment, as even one in four in the “Indifferent” segment is beginning to explore ways to reduce electricity. However, the study also found that even the greenest segments would not choose green benefits over cost benefits. The study findings reinforced previous findings that even where customers believe in global warming and the importance of conserving energy for future generations, such as those in the “Opportunistic” segment, “they are driven by practicality and cost savings, not by a strong green ethos.”¹⁵

Another aspect of this study examined how the various customer segments regarded services that the utilities could offer that would give the customer more control. J.D. Power considers customer control over their energy usage one of the key benefits of the smart grid and also a key opportunity to getting customers engaged. One major strategy is customer control over their bills and rate plans. However, the study found that four of the six groups wanted to continue on a flat rate program or a flat rate with a rebate for demand response program participation (“Indifferent”, “Novice”, “Control”, and “Innovator”). Only two of the six were interested in a flexible rate program that offers different rates at different times of the day (often called time of use rates because the rate is based on the cost of energy at the time it is used). The two groups interested in a time of use rate were also interested in acquiring appliances that would be able to communicate with the grid in order to run at the most cost effective times of day. Not surprisingly, rate plan preferences correlated with the segment’s attitudes and behaviors on energy efficiency. Those who were in favor of a time of use rate plan were also technology-savvy and willing to let the technology work for them, minimizing both their costs and their inconvenience (“Automate”) or were looking for a way to save on their energy bills (“Opportunistic”). However, those who were in favor of a flat rate plan are those customers who do not embrace new technologies, nor trust the utility with control over any aspect of their home life, nor are not willing to change their behavior. Even with these anticipated savings, the three less engaged segments and the most engaged segment were not interested in changing their behavior even for energy savings.

This survey found some interesting challenges for regulators and utilities. On the one hand, the majority of customers are willing to take some action. On the other hand, most of the actions are limited in scope. The study found 76% of customers’ demonstrated limited engagement or readiness to respond favorably to smart energy program offerings and that control over their rate programs is a benefit that is either not understood or not valued by many customers.

On the positive side, the study has helped to identify several ways in which the utility could start to build more successful relationships with their customers, helping to answer the questions they are currently asking and through that relationship hopefully helping to move them along to the next stage of engagement. For example, the largest segment, “Opportunistic” represents 30% of the utility customers. Through this study this group is now known to be interested in a time of use rate and understanding how much electricity their appliances actually use, a combination of information that could drive them to make the types of energy efficient investments that they have to date been reticent to make. Moreover, the enthusiastic but un-active “Novice” is interested in better understanding the

¹⁵ 2011 Smart Energy Consumer Behavioral Segmentation Study page 3.

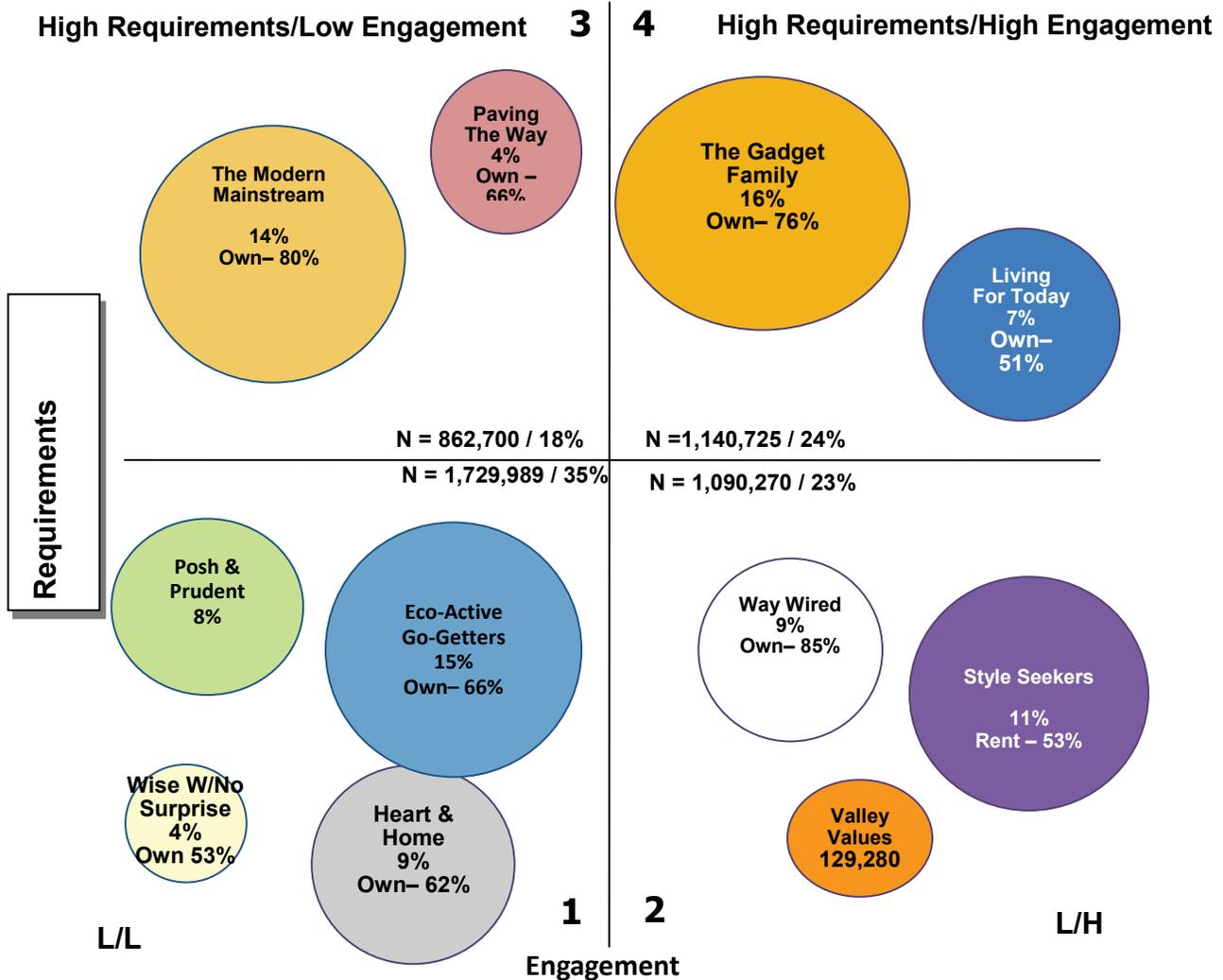
cost benefit calculation of actions. Presented simply and concisely and through the right channel, the information could encourage action. Finally, the study found an overwhelming interest across all segments to “receive points for reducing energy use,” an indication that a rewards program would be well received.

iii. PG&E Segmentation Efforts

Each of the California investor-owned utilities has also conducted extensive market segmentation studies of their own. We have chosen to highlight PG&E’s because they are further along in their ability to correlate the customer segments with program participation.

PG&E based their segmentation on a number of factors, but the primary two factors were the actual engagement levels of the customers and their utility requirements. PG&E defines “engagement” as any interaction with the utility from calls for outage assistance to participation in low income bill assistance programs and participation in energy efficiency rebate programs. As opposed to a survey-based approach, PG&E segmentation efforts use actual customer data, enabling segment definitions to be created and connected to each individual customer. After analyzing its customers on multiple dimensions, PG&E’s customers fell into four segments: High Requirements/High Engagement, High Requirements/Low Engagement, Low Requirements/High Engagement, and Low Requirements/Low Engagement. Further refining the four segments with lifestyle data, 11 personalities or “personas” emerged. Each quadrant has one major persona in it.

Figure 1. PG&E's 2012 Residential Customer Segments



The five major (largest and/or most active) personalities in the PG&E study are the following:

1. **The Gadget Family (16%, High Requirements/High Engagement)** are tech-savvy, larger households who earn moderate incomes and own large homes with high utility bills and all the latest equipment. While they are willing to pay for technology, they do so consciously and studiously. They show a tendency toward careful financial management, which may lead them to consider incentives in their purchase decisions. This segment actively participates in utility energy efficiency and rebate programs and in general shows a more involved relationship with their utility provider, including using digital channels to manage their use and pay their bills.
2. **Modern Mainstream (14%, High Requirements/Low Engagement)** are typically older, family-oriented, comfort-seeking, higher-income, tech-savvy, quality-conscious customers who own larger homes with high utility bills in the non-temperate areas. They are home-oriented and do home improvement projects. Despite their higher requirements, they are less engaged with

most of the utility programs offered and tend toward a more traditional relationship with their utility provider, paying by check each month and not using online account tools to manage their usage. Financial security and a focus on life's little luxuries may be preventing this group from becoming engaged with energy saving solutions.

3. **Style Seekers (11%, Low Requirements/High Engagement)** are mostly younger, mobile, fashion-conscious customers who have moderate income, low utility bills, and little savings. This group does not pay much attention to the environment, but does take advantage of low-income payment plans. They engage with their utility provider primarily around making payment arrangements, and often use online account tools to manage this process. Lower bills, a more migratory lifestyle and smaller, common-wall homes limit their likelihood to adopt energy efficiency solutions.
4. **Way Wired (11%, Low Requirements/High Engagement)** are mostly middle-aged, high-income households living in the coastal climates. They have large homes, high utility bills, and are very environmentally conscious and willing to pay more for environmentally-friendly products. This highly educated and financially savvy group engages with energy efficiency solutions at a higher rate than most other groups. Their focus on the environment combined with their "early adopter" attitude likely drives this larger share of energy solution engagement.
5. **Eco-Active Go-Getters (15%, Low Requirements/Low Engagement)** are urban dwellers, two-thirds of whom own their own home and live in a temperate/coastal climate. They are very ecologically-minded, career-oriented, high-income, tech-savvy, out-door loving, and cultured consumers. But they participate in almost no utility energy efficiency programs even though there are opportunities to reduce their utility bills, often because they do not believe the programs are aggressive enough. They often automate their utility bill payments so there is almost no interaction with the utility at all.

Each of these personas, which represent the five largest or most active of the eleven PG&E personas, have both needs and opportunities for utility program participation, and yet only the "The Gadget Family" and the "Way Wired" personas actually participate in programs other than payment plan programs with any great frequency. In some cases, the marketing message of the efficiency programs could be tailored to encourage greater participation, but in other cases, the overall personality of the group is just not inclined to participate. "Style Seekers," for example, are not interested in energy. Their low utility bills and low concern for the environment do not inspire them to participate in programs, and based on PG&E research, they are more interested in spending their time and resources shopping. Similarly, the "Eco-Active Go-Getters" are also not inclined to participate, but unlike the "Style Seekers" they appear to be a perfect target audience: although their energy usage is relatively low compared to other groups, they are very interested in the environment, own their own homes, and have the money to invest in energy efficiency. Nevertheless, whatever actions they are taking, they are not taking them with the utility.

Table 3. PG&E Customer Segment Program Participation

	Gadget Family	Way Wired	Style Seekers	Modern Mainstream	Eco-Active Go Getters
% of total customers	16%	8	11	14	15
Rebates (2012)					
% of customers participating in program	34%	34	7	5	0
% of segment participating in program	35%	68	9	6	0
Smart AC (2012)					
% of customers participating in program	40%	27	10	9	5
% of segment participating in program	13%	18	5	7	2

As seen in Table 3 above, the participation levels among customer personas vary greatly in the two programs highlighted. While the “Gadget Family” and “Way Wired” personas participate in both the Rebate¹⁶ programs and the Smart AC¹⁷ programs to a far larger extent than the other personas, only the “Way Wired” group demonstrates any real saturation of the persona, with 68% of the persona participating in the rebate program. As per their segment preferences, “Way Wired” homeowners have both the financial and the environmental motivation to participate in utility programs, which is likely why such a high percentage participate in the rebate program. A much smaller percentage of the segment participates in the Smart AC program, which may be attributed to the fact that many of them live in more coastal climates. The “Gadget Family” also participates more actively in the rebate program than the Smart AC program, although it is not clear why. Conversely, the “Modern Mainstream” segment also have the financial and environmental motivation to participate and yet don’t participate to any great degree in either program. While no “Eco-Active Go Getters” participated in the rebate program, their stated commitment to the environment might suggest that they are purchasing energy efficient products, but are not cashing in the rebates.

The J.D. Power study provides some additional potential insight to their participation behavior on the Smart AC program. The marketing of the Smart AC program suggests that the program participant can earn money for participating in the program (through the sign up payment), save money through

¹⁶ The Rebate program numbers represent the entire rebate program operated by PG&E. The participation is based on PG&E evaluations not customer responses and takes into account even rebates taken at the register.

¹⁷ Smart AC is a program offered by most utilities in California where the household agrees to allow the utility to cycle their air conditioning unit remotely during select days.

reduced energy bills, and help reduce their environmental impact. However universal these messages may appear, and however large a group one might think the program would attract, customer behavioral segmentation provides some useful insights. For example, the behavioral segments created in the J.D. Power study demonstrate that these messages will only appeal to one quarter of all customers. The rest of the customers might not participate for a variety of reasons including: no interest in any utility program, no matter what it is (Indifferent, 9%); no interest in sacrificing comfort for savings (Novice, 17%); no interest in having the utility control the thermostat, even though they might be willing to control it themselves (Control, 21%); or, no interest in technology-related solutions (Opportunistic, 29%).

Like the Opinion Dynamics and J.D. Power surveys, PG&E's actual customer data show low overall participation in energy efficiency programs and high barriers to participation. This data is useful in demonstrating that even those customers who might benefit from programs are not taking advantage of them.

IV. RECOMMENDATIONS

We undertook this effort to understand who the customers of today are and how they are responding to the current suite of utility programs in order to better understand how they would embrace the impending paradigm shifts in the electricity sector. From renewables and electric cars, to smart meters, energy efficiency and the EESP's Big Bold Goal of ZNE homes, there are many significant challenges ahead for the customer and the electricity sector. Customer segmentation data should be used to do at least the following:

1. Refine program participation and technology adoption/deployment forecasts.
2. Target programs to early adopters first, then high users of energy. Build on early success/penetration to reach other segments (word of mouth, advertise success stories, lessons learned).
3. Design multiple ME&O messages to fit multiple segments.

The electricity sector is entering a new paradigm where customer actions are more important to the overall operation of the grid than ever before. As noted previously in this report, much of the discussion around customer participation in the grid centers on the concept of customers becoming "smart customers" and/or taking on the role of "energy managers" in their own homes.

There are two primary actions that the utilities and regulators should consider in order to better embrace the challenges and the opportunities that this paradigm shift of the customer role provides the industry:

The **first** action that should be taken is prioritization of customer engagement through program designs and service offerings using additional data collection and analysis of customer needs and motivations. This paper is based on extensive customer segmentation research conducted by two highly regarded firms, and one internal study by an IOU, all of whom recommend further data collection and analysis be

conducted to understand more fully what motivates customers and drives their actions. In addition, further exploration of the role of homeowners as “energy managers” would also be useful in order to better define the term and set realistic expectations for customer adoption. This analysis could also play a large part in future product and program design and evaluations.

The **second** action is to expand the service offerings of the utility to better meet the needs of the customers in the new paradigm. If the customer is to make the transformation into an energy manager, he/she will require a significant amount of education, advice and other personalized resources that will help to facilitate and hopefully automate many of the energy management actions. There are many roles the utility and the larger energy service market could play in terms of providing this assistance. Mapping out the role of the utility and those of the larger market will be critical to successfully embracing the new paradigm.

These challenges to our industry require transformative solutions, and as such will take significant time and effort to achieve. As a first step, we propose forming an informal working group to begin looking at what exactly needs to be done to prepare the utilities, regulators, market, and consumers for the new paradigm. We envision that the results of this working group will be solutions to a successful execution of an industry-wide paradigm shift.

Customer participation, more than the actions of the utilities or of the regulators, is critical to meet California’s greenhouse gas emission goals in a cost-effective manner. Therefore, it will be crucial to the success of the overall goals to construct customer outreach systems that are designed specifically to meet both the needs of the customer and the needs of the system. In other words, programs should be designed to align with customer motivations, as well as reduce carbon emissions. If the customer’s needs are met, the customer will be engaged and the emissions targets will more likely be met. The demand curve has been successfully flattened over the last thirty years, but in order to decrease our demand by the levels required to meet AB32 goals, the electricity industry must make its own paradigm shift.