

Consumer Engagement: Facts, Myths & Motivations

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Abstract

In October of 2010, the EPRI Smart Grid Demonstration Initiative determined that a comprehensive evaluation of customer perspectives toward smart grid technologies is needed to further our understanding of customer motivators. The member utilities desire information to know how to address what could be interpreted as a lack of interest in the new technology. Understanding the customer's attitudes towards smart grid technology will help coordinate items ranging from the design of informational materials through assisting regulatory bodies to better relate to the consumer.

To engage the customer we need to understand the value drivers in their terms and be able to create a "pull" where customers are asking to become involved in grid modernization and smart grid technology. The research covered in this public whitepaper is focused on customer drivers and perceptions along with lifestyle impacts. Discussion includes the top several motivators, customer perceptions, and conflicting information consumers may have received from various sources. Key issues discussed are motivation, consumer value and developing an understanding of the issues that can help approach effective customer education with a common industry message.

1. EXECUTIVE OVERVIEW

The consumer engagement research project was requested by members of the EPRI Smart Grid Demonstration collaborative as a strategic focus area. The project was chartered to address the following research topics: 1) the motivation for consumer adoption of smart grid technologies and programs 2) the problem being addressed or opportunity pursued with smart grid technology, and 3) identifying the logical steps forward for engaging the customer and other interested parties with a common industry message.

The approach to understanding of customers has traditionally focused on surveys and a qualitative approach

using data points from customer focus groups. While both of these offer opportunity for valuable customer insights, they tend to be a single point snapshot in time. Neither a survey nor a single-session focus group gives opportunity for the consumer group to give repetitive thought to the issues at hand.

This research was launched by conducting a background scan from a variety of sources such as EPRI reports, utility reports, whitepapers, current and past pilots, news articles, and surveys as a first step to clarify current understanding from previous consumer studies. A consumer interaction study was undertaken that involved several groups of residential consumers from a variety of backgrounds, ages, household types, and locations. Two in-depth online bulletin board discussions allowed direct interactions with consumers over a period of five days using a moderated private on-line interaction method. This qualitative discussion allowed consumers to participate at their convenience and allowed both gathering of information and observation of the consumer learning process.

Findings from the interactive study were analyzed in several ways. First these learnings were examined purely from a perspective of key words, phrases, and concerns. Next the results were viewed from a utility industry perspective to look for key learnings and disconnects relative to industry experience. A review of the background scan data was reviewed relative to the consumer interactions in this study. This approach enabled a number of observations.

Consumers, when asked to conserve or shift energy, may not have adequate knowledge of their energy consumption to be able to select an effective response. Study participants indicated a desire to know how much electricity they use, when they use it, and how much it costs in time to appropriately impact their monthly bill. The consumers in the study assumed that energy consumption information would be provided, by the smart grid, broken down by circuit or by appliance. The consumer data, in both this study and other studies referenced, indicated that without this information, consumers tend to make incorrect changes

that could cause frustration in their inability to impact their monthly bill.

Participants, after being educated about smart grid technology, developed an interest and desire to know more and potentially consider personal involvement. This implies that the education needs to be clear, accurate, and may benefit from being a separate effort prior to an invitation to join a program. If awareness and accurate understanding is established first, this may drive motivation and actions as an independent precursor step in the path to create the consumer “pull”. The study made a special effort to uncover how these consumers, once the concepts are understood, would describe the smart grid or smart grid technology.

The participants ranked the value of the technology in a priority order. Participants identified cost/bill savings and environmental motivators as the top two motivators. Toward the end of the week-long interaction study, their perceived value of reliability seemed to increase to some degree. Participants in the study, although motivated to some degree by environmental concerns, did not make a connection to the actual environmental benefits resulting from their energy conservation actions. Participants ranked environmental concerns high, yet ranked reducing the need for power plants low in order of importance. This may be a disconnect that, if resolved, might further engage consumers who value environmental concerns.

The consumer issue of data privacy surfaced on its own without the topic being brought up by the moderator. This was an indication of the existence of other influences on consumer opinions. The study uncovered that when consumers are presented a list of privacy concerns that includes smart meter data along with other commonly gathered consumer data such as credit card usage, banking information, and purchasing habits, the consumers dropped the concerns about meter data privacy to a very low position in the list. Simply offering this comparison helped to resolve this concern in their minds. This was verified in a follow-up survey to a separate group of 1,000 consumers where only 4% indicated concern over smart meter data privacy.

This report helps to identify information that should foster consumer interest in the smart grid technology. This study provides some phrases and analogies the consumer used to describe smart grid benefits. This information can provide additional background to help utilities develop informational materials and help stakeholders relate to the consumer.

This report offers considerations in how to approach consumers with smart grid technologies and benefits. The results of this study present consumer motivators that span across topics including financial, societal, environmental and personal that can offer guidance in the design of an approach to consumer engagement. The study also offers

some insight as to where consumers turn for trusted information and notifications. This will assist in planning a path to the consumer via what the consumer-considers to be reliable sources of energy information.

2. PROJECT BACKGROUND

The goal of the consumer engagement study was a comprehensive evaluation of consumer perspectives toward smart grid (SG) technologies and programs. Separating the facts, myths, and motivations is a challenge relative to consumer behavior. It is difficult, and possibly arguable, to claim that facts are being reported when dealing with consumer opinions and consumer information in general. Therefore consumer information, offered by way of quotes from the interactive part of the study, are included in the appendix. In conjunction with the other informational references, the reader of this report can combine this information with their own experiences to develop what their program could assert as being actionable facts.

The consumer motivations covered in this project come by way of a combination of the direct consumer responses, in the interactive part of the study, combined with the grid perspectives and background search. This report offers a variety of considerations that can provide input into consumer education and program designs that work together to motivate consumer engagement.

Regarding the “myths” mentioned in the title of this paper, a myth could be defined as something previously assumed to be true about consumers. Yet if this unchallenged or unconfirmed “truth” were allowed to drive program design, the results could be compromised. The reader is encouraged to compare the data and results offered in this report with individual assumptions relative to consumer knowledge, lifestyles, and motivations to determine if there are any of these “myths” that need to be challenged. Although this is suggested as an exercise for the reader, the following is an example of a myth that may be challenged by this study. A utility program may have assumed that consumers know how to effectively conserve energy or shift peak consumption. If this is false, then regardless of the level of consumer acceptance of a utility program, the success of the program may be vulnerable since a false assumption of consumer knowledge was acted upon.

2.1. Questions Driving the Study

- How can we address what could be interpreted as a lack of interest in the new smart grid technology?
- How would a consumer describe the technology?
- What terms would help them identify the need and benefits?

- How can we go beyond acceptance and create a “pull” where customers start asking how they can become involved in the smart grid?

This was driven by concerns voiced by electric utilities with experiences indicating:

- A lack of ability to show value to customers.
- Low customer demand for smart grid technologies based on preliminary studies.
- Assumed negative impact on consumer lifestyles.
- A lack of knowledge of key motivating factors.
- Reluctance of manufacturers of consumer devices and products to embed or enable SG technologies.
- Conflicting information circulated about smart grid technology originating from various sources, many of which are outside the utility circle of influence.
- A lack of accurate information available to be utilized by the various disseminators of consumer information.

Three key driving issues involve consumer motivation, understanding the problem in consumer terms, and developing a common industry message.

On August 18, 2011 the NY Power Utility Commission issued a smart grid policy statement [1] that included: *“Engaging Customers: Utilities must provide basic information on smart grid to customers who are largely unaware of this technology. Utilities further must provide a thoughtful and comprehensive customer education plan before commencing with implementation of technologies that require extensive customer engagement.”*

Other organizations, such as the Smart Grid Consumer Collaborative [2], also embarked on similar goals to gain knowledge of what consumers need and how to communicate with them. These and other utility organizations have recognized the need for the type of research in consumer engagement EPRI has approached in this study.

2.2. The Approach

The consumer engagement strategic research project was initiated by conducting a background scan from a variety of sources such as reports, whitepapers, recent and past pilots programs, news articles, and surveys. (See Topical Background Research.) Utilizing an information gathering source outside the utility industry was considered as an appropriate approach to identify basic consumer understanding, consumer terms, and issues. Smith-Dahmer Associates was selected to conduct this part of the study and brought experience in conducting and evaluating this type of consumer interaction. Much of their work has been

performed for organizations that design consumer products and devices for which consumer perspectives play a key role in the design of products and services.

The analysis in the Consumer Interaction Study section takes the perspective of extracting key thoughts, words, concepts and phrases from the consumers without necessarily matching this information up with a utility and smart grid knowledge perspective. This was intended to provide a starting point with a pure look at understanding, terms, and motivators. Later in Grid Perspectives on Consumer Interaction, the results are discussed from the perspective of the smart grid applying this knowledge along with experiences gained in the smart grid demonstration projects. In conjunction with the background scan and by applying knowledge of the smart grid, the team applied a utility-perspective to the consumer data. This helps expand the learning and extract information of a more strategic nature.

The approach selected for this study utilized two 5-day customer interaction sessions that involved several groups of end consumers from a variety of backgrounds, ages, household types, and locations. The two in-depth online bulletin board discussions allowed interactions with consumers over a period of five days using a moderated private on-line interaction method. This qualitative discussion allowed participants to participate at their convenience and allowed the discussion to unfold with greater depth and clarity. Appendix A provides information on the consumer selection process and the demographics of participants.

Several key findings were used to create follow-up questions for a quantitative statistical read from a larger group of 1,000 respondents. This gave opportunity to validate learnings from the interactions in a more quantitative study.

2.3. Issues, Barriers and Assumptions

Customer perception, attitudes, and information sources may be divided in several ways. First consumers may vary by regional thinking, perhaps based on regional or personal experiences. If consumers live in an area that has experienced energy or environmental issues, their perceptions may be different. The willingness of consumers to adopt technology or accept information can vary by these regional influences. Although consumers were selected to represent a broad region and other personal demographics, this whitepaper does not state any claims regarding a complete consumer demographic representation. (See Appendix A for demographics of consumers selected for participation.)

Consumers get information that they deem as reliable from a variety of sources. Whether or not these sources of

information are in fact reliable is secondary to learning what these sources are. A reasonable list was extracted in this study although in our connected society we have to assume that additional sources can pop up literally overnight. As further detailed in this report, the study team had opportunity to observe the consumer learning process in addition to consumer attitudes and knowledge relative to smart grid technologies and benefits.

3. CONSUMER INTERACTION STUDY

3.1. Introduction

The consumer interaction study is evaluated in this section from a pure consumer research perspective to seek understanding of consumer terms, attitudes, knowledge, themes, and information sources. Smith-Dahmer Associates [3] was commissioned to conduct this study with consumers to understand their perspectives toward smart grid technologies. In addition to understanding the value they see in smart grid technology, the study also provided a look into how consumers learn about new technology.

Smith-Dahmer utilized an interactive bulletin board to interact directly with consumers during two 5-day customer interaction studies. The demographics of the two groups of residential consumers covered a variety of backgrounds, ages, household types, and locations. The first group was selected from consumers who are aware of smart grid technology. The second group was selected from those without previous knowledge of the smart grid. [4]

The two independent online bulletin board discussions allowed interactions with each group of participants over a period of five days using a moderated, private on-line interaction method. Participants received two discussion questions each day and could read and reply to responses left by the other participants in their group. This discussion method allowed participants to participate at their convenience.

3.2. Consumer Attitudes

Nearly all of the consumers interviewed see themselves as diligent about their energy conservation efforts. Regardless of their level of concern about the environment or about energy costs in the home, the amount of electricity that is consumed is carefully considered. They are making what they see as diligent efforts to educate themselves on ways to reduce their use of electricity and utilize those methods in the home. Those methods include:

- Choose energy efficient appliances (however, none would replace a working, inefficient appliance)
- Use CFL light bulbs
- Unplug electronics when not in use

- Manage use of heat and air conditioning such as using the “energy saver” feature
- Turn off computer/keep computer on standby
- Turn lights off/use motion detection lights
- Run washer, dryer and dishwasher only with full loads and at night/non-peak times
- Use a surge protector and turn everything off at once
- Install a programmable thermostat
- Hang clothes vs. using dryer
- Use public transportation
- Use “green plugs” on appliances
- Use special curtains for keeping heat in/upgrade windows/keep blinds closed to keep home cool

3.3. Consumer Reasons to Reduce Electricity Consumption

The main reason given by study participants for reducing electricity consumption is money savings. Protecting the environment is a bonus.

“I’ll be honest; my primary motivation in managing the electricity is the cost. It’s not that I don’t care about the environment; I absolutely do. I despise the thought of being wasteful with electricity or other resources. But at the end of the day, my wallet has the most significant impact on how I manage my consumption.”

For a minority of consumers, the environment is the main reason for conservation practices. For them, a clear conscience or a feeling of responsibility that comes from doing the right thing is a powerful motivator.

“It is ‘guilt’ from wasting. I have seen places that do not have what I have and I would like to be as limited a burden on the environment as I can.”

3.4. Consumer Frustrations in Personal Energy Conservation

Efforts to reduce electricity consumption are not always easy – or successful. A variety of factors contribute to frustration and failures, despite good intentions:

- Others in the household are noncompliant or lack diligence.
“I live with teenagers who think electric is free. I am on them at all times to turn off appliances when not in the room.”
- There is conflicting or confusing information. Participants admit that information that guides their behaviors is not validated. They often can’t recall where

the information came from and are uncertain whether it is accurate. Several of them resort to conducting “experiments” to determine how to best reduce consumption and impact their utility bill.

“I try and keep things unplugged that are not in use. I have been told even though you are not using them, electricity is still being generated through the plug. Whether this is true or not I don’t know but I figure it doesn’t hurt.”

- The activities are random and results are not always obvious.

“There’s no real rhyme or reason [to managing my energy use].”

- Results are minimal – or not perceived as worth it.

“It is difficult to make a significant impact on one’s electricity bill. In an experiment, we unplugged all the excess appliances. We noticed a \$10 difference in the bill, but just got lazy again.”

“We slowly raised the temperature to 76 degrees and it netted us about 15 cents in savings and a very unhappy and maladjusted me. I have tried to do the ‘schedule’ thing with the thermostat, but I have read that it actually makes your rates go up.”

“I use my home appliances when I need to. I don’t not use them to save electricity. For instance, I can set my air conditioner temperature at 74 degrees and feel very uncomfortable or set it at 72 and feel very comfortable. At the end of a month, I pay more to feel comfortable. I believe it is worth it.”

3.5. Consumer Information Sources Identified

The most common source of information about how to conserve electricity in the home is word of mouth (“I have heard that...”) For those who are more aware of smart grid technology, sources of information range from traditional print and TV to internet and word of mouth. Specifically, those who are aware have turned to the following sources of information:

- Broadcast media: Informative TV networks/shows: A&E, Discovery, CNN, Science Channel, Clark Howard, Money, nightly news, Fox News
- Newspapers: Wall Street Journal, New York Times
- Magazines: Fast Company, National Geographic, Discover, Time
- The power company: Utility bill, a phone call to the power company, information packets

- The Internet: Wikipedia, About.com, Bing/Google search, news feeds about technology, blogs, CNN.com, Providencegeeks.com

- Local community: Local news, neighbors affected by a vote on implementing smart grid, school district

Respondents who came to the research with little to no understanding of smart grid technology were asked to do some research. Sources these participants selected for their research include:

- The Internet
 - Wikipedia (This source is the most commonly used. It is perceived as easy to understand, providing lots of useful information and a historical perspective.)
 - ge.ecoimagination.com (perceived as easy to use with helpful visuals)
 - NEMA.org
 - Siemens
 - IBM.com/smart_grid
 - Galvinpower.org
 - Bizadvisorchallenge.com
 - Gridnews.com
 - IHS.com
 - Sheddinglight.org/smart-grid (has useful videos about why you should care about smart grid)
 - Youtube.com
- Other sources used:
 - A friend (but noted that few of their friends could explain the technology or its benefits)
 - Newspapers
 - TV: Discovery channel

3.6. Understanding of Smart Grid Technology

After conducting research, the unaware group of consumers replayed their understanding of smart grid technology with focus on how it will help their communities and the environment as a whole. Below are some examples of how they describe their understanding of the technology:

“Smart grid technology allows us to predict energy usage in order to balance across all users and ensure we are delivering energy in a sustainable way.”

“Smart grid is where the U.S. national grid system and the regional, state, city, neighborhood electrical grid system uses technology to balance loads. I understand it to be a type of electrical grid that predicts and responds to the conduct of everything connected to it to deliver and regulate energy efficiently. This is a system the government promotes as a way to address energy

dependence and a way to help reduce global warming. Smart Grid Technology would provide information quicker than the current set-up and provide information two-ways, cutting down on the use of back-up power plants.”

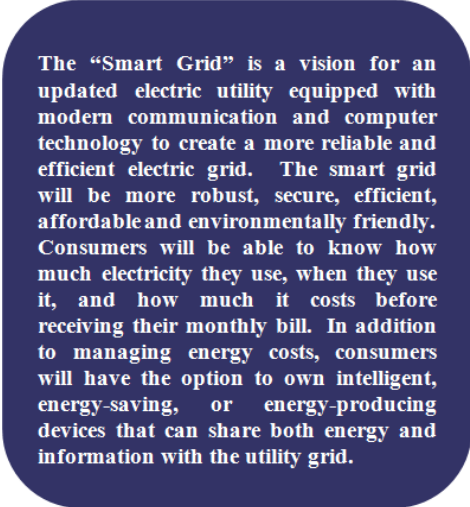
But many are unsure how it will impact them as individuals. Some indicate they developed a craving for more information about tangible outcomes. Their research does not provide any information about the degree to which it might save them money. This issue may be the most important benefit for all consumers. The greatest information need is specificity and examples.

“While the [GE ecoimagination] website was helpful, it generated more questions for me; it refers to using 21st century technology to access the 20th century power grid – what does this actually mean? What kind of savings would I actually see if I were to use a smart meter? How does it actually help efficiency?”

Consumers expect to get this information primarily from the electricity provider but also from:

- Town hall meetings and local community interactions
- Internet
- On the news
- Direct mail
- Print advertising
- Local TV advertising

Both groups were shown a definition of smart grid technology to determine whether it is clear and informative.



The “Smart Grid” is a vision for an updated electric utility equipped with modern communication and computer technology to create a more reliable and efficient electric grid. The smart grid will be more robust, secure, efficient, affordable and environmentally friendly. Consumers will be able to know how much electricity they use, when they use it, and how much it costs before receiving their monthly bill. In addition to managing energy costs, consumers will have the option to own intelligent, energy-saving, or energy-producing devices that can share both energy and information with the utility grid.

Figure 1. Proposed Smart Grid Definition

Overall, participants feel the description is understandable, compelling and addresses the important issues. In particular, the most compelling aspect of the definition offered is the benefit, “Consumers will be able to know how much electricity they use, when they use it, and how much it costs before receiving their monthly bill.” Articulation of this benefit allows them to bridge the gap created by their initial research which only helped them understand the benefits to the environment or the community overall, not for them as individuals.

“Wow! Awesome! I can’t wait to utilize the energy-saving and producing devices especially since they are going to let me know how much electricity I use and when I use it.”

Although the definition provided was clear and compelling, it also raised some questions, mainly focused on cost. Additional questions are related to how it works.

“Whose ‘vision’ is it?”

“The definition would be better if it gave the consumer an indication of how much it may cost.”

“A utility with modern equipment and technology: What does this mean? Don’t they currently have modern equipment and technology? A more reliable and efficient electric grid: Isn’t the current grid reliable and efficient?”

“How will consumers know how much electricity they use--is this something they can look at daily? Weekly? Monthly? How will they access the information?”

3.7. Consumer Concerns about Smart Grid Technology – Barriers to Acceptance.

Privacy is a concern for some, but not all respondents. Some study participants believe that smart grid technology may have been created by the United States government in order to gather information about individuals for either marketing purposes or profiling. Others are simply worried about the potential for hackers to know when homeowners are away from home.

“Big Brother watching you could be a possible root cause to this whole idea.”

“There is a possibility of information being sold without my consent. That information is valuable to marketers that sell appliances and would be profitable for them to know who is currently using the technology and a prime consumer for more devices.”

Participants want assurance that information related to their electricity use is being collected and used only for purposes of managing the grid and their own use. Several participants are interested in a commitment on the part of the utility

company that data will not be used for marketing or profiling purposes in any way.

Cost is also a concern related to smart grid technology. There is uncertainty about set-up cost, the costs for the energy-saving and energy-producing devices and who will pay for it. Current behavior is to replace old, inefficient appliances in favor of energy-saving appliances when they stop working, not before. So this would require a dramatic change in behavior. In addition, the primary reason for conserving electricity is saving money – so the technology would need to demonstrate how it will save money in the long run.

“I have heard that the smart meter is very expensive to install.”

“If the system breaks, who pays to restore it...i.e., ongoing operational expense?”

Concerns about reliability also surface with the definition, although less common than privacy and cost.

“My only concern would be a guaranty of electrical power...no interruptions in service or lack thereof.”

While the definition is understood, in order to make it more relevant, participants wanted examples of how it can benefit them directly.

“I would like to see examples of everyday people and how it saved them money or reduced their energy consumption. You can state that something will be more efficient, affordable, environmentally friendly, but until you describe it in terms that people can relate to, it would be a harder sell.”

“Most people want to hear or see how it will affect them individually where it counts...in their wallets/pocketbooks. I wouldn’t concentrate heavily on the benefits to the world and how this is accomplished over time, etc... (even though this is a great thing) it’s not going to grab the average consumer and pull them in. What will pull them in is ‘I can save you \$100/month on your electric bill by doing ...’ and then show an example. The grand scheme of this grid is phenomenal. I just think it’s getting lost in its grandeur and needs to be simplified. Layman’s terms.”

3.8. Benefits of Smart Grid Technology – Where Do Consumers See the Value?

Study participants saw the value of smart grid technology primarily as it relates to cost savings, information and control and improving the effectiveness of their efforts.

“The grid will give the consumer a running tally of usage and costs so they will not have sticker shock when their bill comes.”

“Tracking usage over time to educate me when I have peak usage and when I am not using as much.”

“I believe it could help power companies manage the load in such a way as to help them avoid building expensive power generation plants that we consumers eventually pay for.”

After hearing perceived benefits from both groups unaided, the research team provided participants with a list of benefits and asked for a ranking from most important to least important. Cost savings provides the greatest perceived consumer value by far.

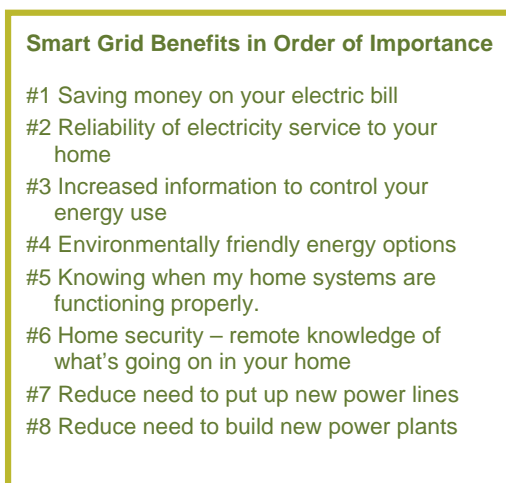


Figure 2. Ordered Smart Grid Benefits as ranked by participants

In addition to these practical benefits, consumers may see emotional benefits and a shift in their outlook on energy conservation. Emotional benefits relate to awareness, which ladders up to control.

“My outlook on electricity would change because now I would be a player, and not just a spectator in this electricity game.”

“Having Smart Grid Technology would change my outlook on electricity because I would make more informed choices about how I consume energy and make the necessary changes to maximum consumption smartly.”

3.9. Communicating Smart Grid Technology – Naming

Consumers agree “Smart Grid Technology” is an appropriate name.

“I’d stick with Smart Grid. I can’t think of another word that would easily sum up the change in energy use that this represents, and it is broad enough to encompass energy from multiple sources. Since this technology is in

its infancy in many markets, keeping it simple is key to getting it 'front of mind' for consumers.”(Aware)

Some participants offered alternative ideas such as: True Use, IntelliGrid, iGrid, Green Electricity, Energy Saver Plus, Energy Wise, Energy’s Green Network, Electrigrd, and Smart House.

3.10. Communicating Smart Grid Technology – Analogies

Often, an idea can be understood by comparing it to something else. In addition, consumers may recall an analogy better than a technical idea. With that in mind, the research team asked consumers, once they grasped the idea of smart grid technology, to draw comparisons of their own. Consumers provided some interesting analogies that help us understand ways in which smart grid registers in the mind.

Complete the Sentence: Managing Energy using Smart Grid Technology is like...

“...booking a vacation (flight, hotel, car) on a travel website and knowing how much each entity costs, to booking a vacation with a travel agent who provides you with one total cost for everything. Like smart grid technology, I have control over what travel provider I choose based on cost, and what I can do (coupons, club membership, etc.) to save money.”

“...keeping track of the number of calories you intake on a given day when you are on a diet. You plan for so much and sometimes though you may go over or you may go under. You then try and balance it out by the end of the month.”

“... being able to use the accelerator on your car. You have control of how much ‘gas’ (electricity) you use. You can set it the ‘cruise control’ or manually control your speed (consumption).”

Figure 3. Consumer Analogies

3.11. Communicating Smart Grid Technology – Problem/Solution/Benefit

Based on responses to our initial definition, benefits expressed in consumer language, and benefit prioritization, the research team drafted statements in the following basic format:

1. Accepted consumer belief – the consumer insight that leads to the potential adoption of smart grid technology.
2. Solution – articulating the solution in language that makes sense to a consumer.
3. Expressing benefits that are particularly relevant to the consumer.

Crafting these statements allow the research team to make an attempt at articulation of smart grid technology in language consumers can understand. It also allows us to test different ways of expressing the most relevant benefits. From this exercise, the following two statements emerged as those most compelling and relevant to participants which reveals to us that the best way to communicate is to address common frustrations previously mentioned by consumers.

Compelling Statement #1: Taking the Guesswork out of Managing Energy Use

I try to use energy wisely: turning off lights, unplugging appliances not in use and using A/C and heat sparingly. But it is hard to know how impactful these things are. There is also some conflicting information out there about how to best conserve energy.

Smart Grid Technology is a way for consumers to know how much electricity they use, when they use it and how much it costs before they get the bill. Smart Grid Technology also provides options for owning intelligent, energy-saving or energy-producing devices that share energy and information with the grid.

Smart Grid Technology allows me to more effectively manage energy use in my home, knowing where to focus my efforts and just as importantly, where NOT to focus. This helps me feel more informed and more confident that I’m really making a difference.

The Statement, “Taking the Guesswork out of Managing Energy Use” addresses a common frustration of energy conservation practices that lack “rhyme or reason.” It provides the benefits of information, empowerment and control.

“I like that the Smart Grid allows me to focus my efforts on what truly makes a difference and have control over what is truly best for me. I am tired of conflicting information. This conflicting information once made my bill go to almost double my norm. I cannot afford to blindly experiment on what works and what doesn’t. I want to know without a doubt what works for me.”

Compelling Statement #2: A helper for my best intentions

I’m extremely motivated when it comes to protecting the environment and spending money wisely. Despite my good efforts and intentions, my family is only human! We often forget to turn off lights, stand in front of the open refrigerator and we disagree on the right temperature in our home.

Smart Grid Technology will provide opportunities to own intelligent, energy-saving or even energy producing devices that take some of the pressure off me and my family. Smart Grid Technology would help my family by automatically turning off lights and appliances not being used and give me

the ability to schedule lights and appliances to run based on my energy conservation goals. Plus, Smart Grid Technology can tell me how much electricity we use, when we use it and how much it costs so I can spend time on truly effective methods and not worry about the things that don't make much difference.

Smart Grid Technology is my home's energy helper - making it easier for me and my family to do our part - by giving us information and tools that take away some of the human error.

This statement "A helper for my best intentions" is highly relatable and addresses a common pain-point: that people in the household aren't very good at managing their use of electricity despite a real and conscientious intention to do so.

"I would be extremely interested in this aspect. This 'helper' would assist in taking the pressure off of trying to control costs and issues. This I believe would be the best selling point for Smart Grid Technology."

"I would rate this a 5 [out of 5] for relevance because I am guilty of leaving lights on, etc. when I should know better. I would rate it a 5 [out of 5] for compelling as well because it would be great to have these things done for me automatically where I don't have to think about it."

Additional ideas were tested, but the consumers did not find them to be as relevant or compelling. Portions of those statements, which garnered notable responses either positively or negatively, are captured below.

The phrase, "Smart grid provides options for owning or leasing or renting intelligent, energy saving or energy-producing devices (such as photovoltaic roof panels, wind turbines or storage battery) that share energy and information with the grid" was polarizing. For some, it creates intrigue. For others, it leads to a feeling of intimidation related to potential cost.

"I love the examples and I wish they were included in #1 and #2 because this would definitely make me more interested."

"It scares me a little to know the cost associated with implementation when you see words like solar panels and wind turbine. It seems like these ideas are cool, but at whose cost?"

A statement was included that focused on working together to have more impact on the environment and individual households' level of efficiency: "...by working together, we're having an even bigger impact - like reducing the need to build power plants and put up new power lines.

With more information and by working together we can all feel like we're accomplishing more for ourselves and for us all."

This was the least compelling and relevant of all the ideas. The idea of working for the common good did not resonate as powerfully as individual and tangible benefits such as saving money or providing control. For some participants, the "greater good" is too big for one household to effectively impact and so the idea is overwhelming.

"This area would be the hardest to see an impact since there are so many variables. The Jones family may really care about their usage while the Smiths could care less. This probably would have zero overall effect not matter what the Jones' did. This would be frustrating."

"Working together doesn't really speak to me. I'm less interested in contributing to an intangible public good and more interested in how this would benefit me personally."

Finally, we asked participants to react to an idea that focused on predictability:

"...Smart grid technology is a road map for managing the energy use in my home. It is a modern system of communication that allows me to have a monitor that provides current up-to-date information so I can know how much electricity I use, when I use it, and how much it costs before I use it. It tells me whether or not my home systems are functioning properly and reduces the likelihood of a power outage. It's like going to the grocery store with a list. Before I go, I know exactly what I need and I buy only what I need, nothing more."

With Smart Grid Technology, I have better plan for managing electricity in my home. My bill and the service to my home are more predictable."

This idea is moderately relevant and compelling. The least compelling part of it is reliability associated with power outages because while it is an important issue to respondents, it's not seen as a problem consumers currently have in the U.S. The most compelling part is predictability of costs. The grocery store list analogy works well.

"I live in a place where we have power outages every so often and it doesn't really bother me. It can be a nice time to disconnect. Reliability just isn't the most important thing to me."

"I like the idea of predictability and the idea of grocery shopping for my needs and not having to pay for items not needed. Reliability and customization are very good selling points for this technology."

3.12. Validating Key Learning

Several themes seemed to capture the interest of the study participants. The project team planned for a follow-up survey at the end of the study to get a larger response to several key questions. Smith-Dahmer Associates [3] conducted a follow-up Omnibus Study that targeted a separate group of 1,000 respondents. See Appendix A for further information on the consumer selection and tool. The questions focused on key learnings from the interactive study including managing information, energy automation, and data privacy concerns.

As shown in Figure 4, 64% of respondents believe that being able to know how much electricity you use, when you use it, and how much it costs before receiving their monthly bill would be “very useful” or “extremely useful”.

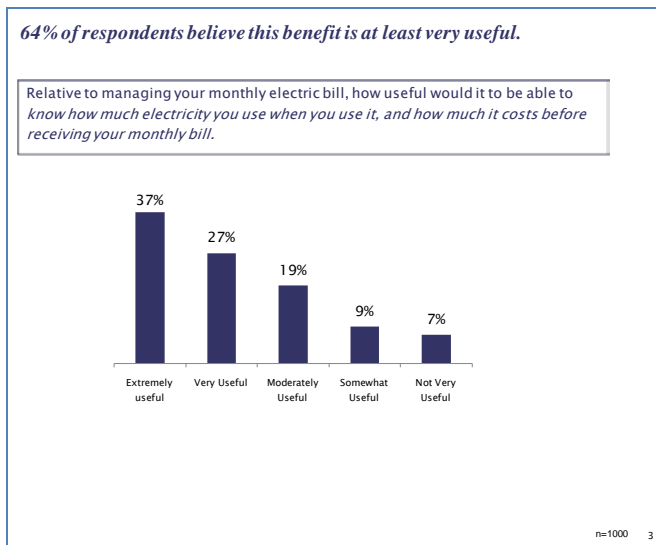


Figure 4. Value of Electricity Usage Information

If we include “moderately useful” and “somewhat useful” this includes 92% of the respondents. This tends to validate what we learned from the interactive groups and may also indicate acceptance of the verbiage used in this part of the smart grid definition.

In another follow-up survey question, 58% of respondents believe it would be very useful to have options for owning intelligent, energy-saving or energy-producing devices that share energy and information with the grid. (See Figure 5) Note that the responses to these questions remained fairly even from age 18 up through 64. As shown in Figure 6 and Figure 7, the level of agreement with the statements dropped off noticeably in the over 65 age group.

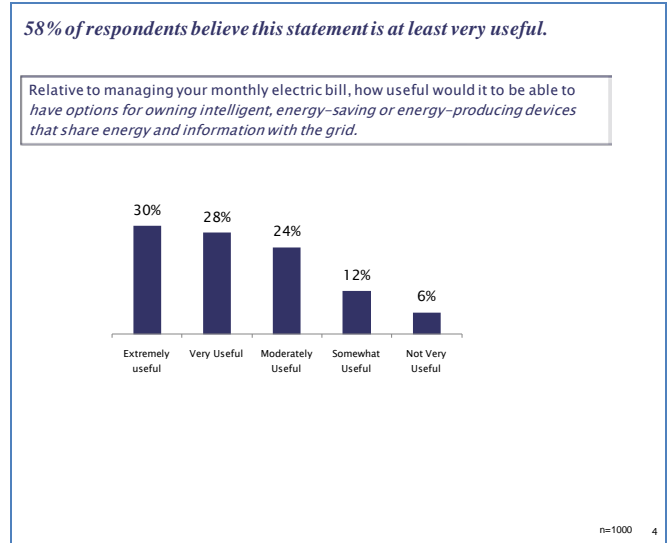


Figure 5. Value of Options to Own Energy Saving Devices

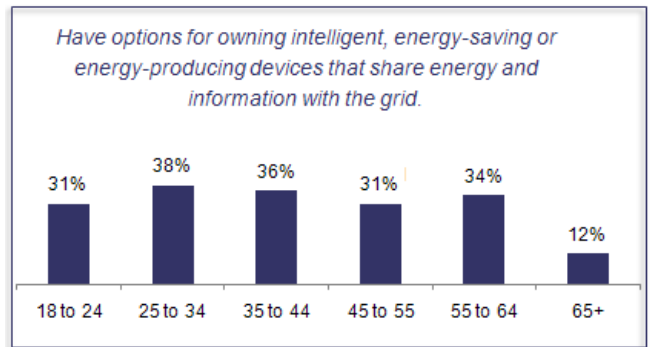


Figure 6. Age Spread in Affirmative Responses (n=304)

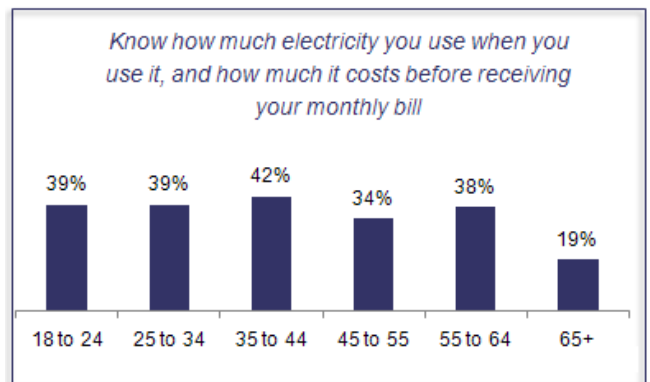


Figure 7. Age Spread in Affirmative Responses (n=350)

The separate group of 1,000 respondents was asked to select their top three privacy concerns from a list that included selections such as personal information, banking, credit cards, social networking sites etc. (See Figure 8) Based on the interactions with the participants, it seemed relevant to

validate, with the larger group respondents, where meter data privacy falls within the larger scope of privacy concerns. This not only helps put the concern into perspective in this report, but may also illustrate the need help consumers examine this concern relative to other

similar social concerns. In the Omnibus Study, the use of smart meter data was selected as one of the top three concerns by only 4% of the respondents while over 70% selected personal information, banking, and credit cards.

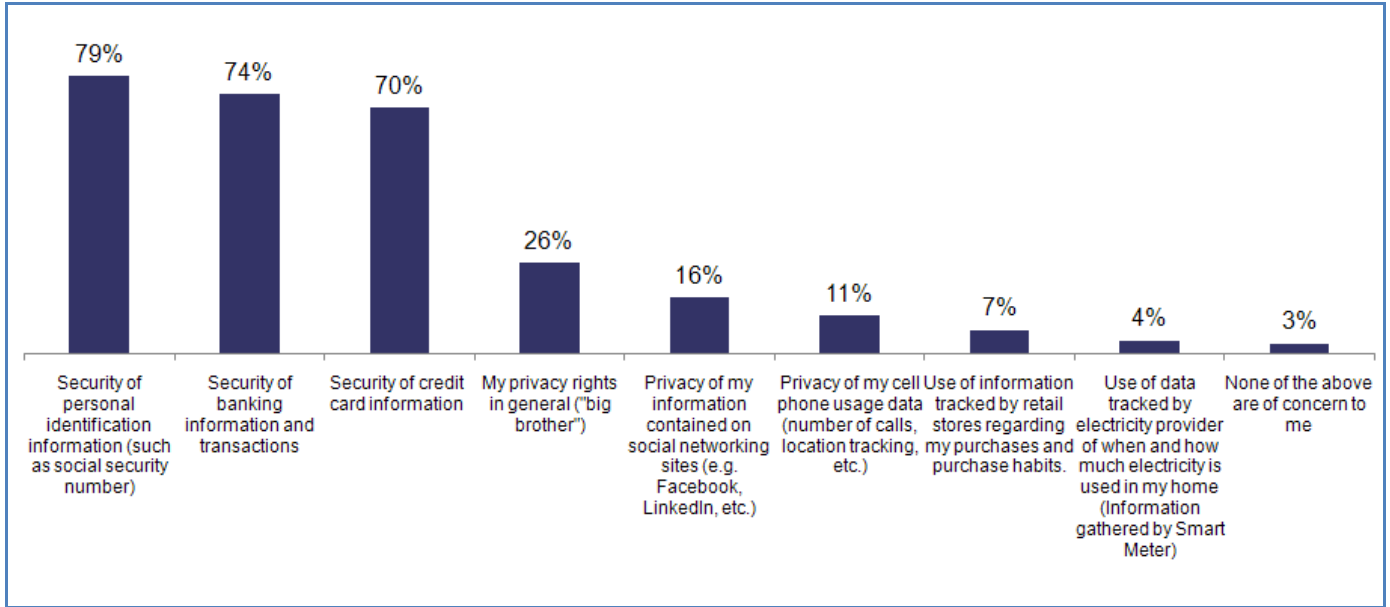


Figure 8. Relative Comparison of Data Privacy Concerns

3.13. Summary and Suggested Applications of Consumer Observations

Primarily, participants are working to conserve energy to save money on their utility bill. Secondly, they aim to help protect the environment.

Many consumers see their efforts to conserve electricity as diligent, but yet, their efforts are basic. Participants indicated that they try and turn off lights when not in use, manage their use of air conditioning and heat and use CFL light bulbs where they can. These efforts are seen by some as futile, because family members don't comply or they are only seeing a minor impact on their utility bill. Others are confused about ways to conserve most effectively. Many hear vague or conflicting information and resort to "experimentation" to determine the most effective ways to save money.

Smart grid technology offers compelling and relevant benefits that the study participants want. However, it is important to communicate the benefits in ways that speak to them directly and alleviate concerns. In this research, we gained insights into how to connect with the hearts and minds of consumers. The list below offers suggestions for application of the study results:

- Focus on benefits to the individual first, then benefits to the environment and/or community.
- Providing tangible examples may help them understand how this will benefit their families specifically. Create scenarios that illustrate upfront investment relative short or long-term money savings. Be as specific as possible.
- When describing the benefits of smart grid technology, create the greatest relevance by focusing on common and relatable circumstances that currently create frustration. Some examples of common pain points include:
 - Lack of knowledge about what is effective and what is not.
 - The inability to know upfront what your electricity bill will be.
 - Inability to control cost and fluctuations in the monthly bill.
- Describe the benefits of smart grid technology in one or a combination of the following ways:
 - More effectively managing energy use, knowing where to focus efforts and just as importantly, where NOT to focus...helping consumers feel more informed and more confident.

- Providing information and tools that eliminate some of the human error.
- Educate consumers of various ages and genders to reduce difficulty some family members face in getting everyone to comply in efforts to conserve.
- Allowing homeowners to focus energy-saving activities on those things that have the biggest impact on the electricity bill, taking away the worry about unexpected costs and ensuring that their efforts really make a difference.
- Use examples to create clarity. The following example effectively explained one of the compelling benefits of smart grid technology:
“It’s like going to the grocery store with a list. Before I go, I know exactly what I need and I buy only what I need, nothing more. With Smart Grid Technology, I have better plan managing electricity in my home. My bill and the service to my home are more predictable.”
- Alleviate concerns about privacy when communicating smart grid technology. Provide information about the intent behind it, reassurance that it will not be used against them and that it is secure enough that outsiders will not have access to it.
- Consumers appear to rely heavily on the Internet when they seek information about smart grid technology. It will be important to influence content that appear on websites that come up at the top of search engines such as Wikipedia. To reach consumers who are not actively seeking information on smart grid technology, utilize public relations strategies that influence credible TV and print news and informative feature content. Advertising in information-related mediums may also be effective. Finally, consumers also expect to hear about smart grid technology from their utility company in inserts, newsletters and special notices.

4. GRID PERSPECTIVES ON CONSUMER INTERACTIONS

4.1. Introduction

The discussion presented in the Consumer Interaction Study, presented a pure consumer data perspective that identified key ideas, messages and themes. This section presents information gathered from the consumer sessions from the perspective of the smart grid. Based on utility and smart grid understanding, we discuss consumer learning along with experiences gained in the smart grid demonstration projects. This places the raw data from the study participants into a utility perspective.

The discussion below is focused on a number of EPRI observations taken from consumer responses and placed in

the context of the utility industry and the smart grid. The EPRI Smart Grid Demonstration project team, in both this section and the section titled Topical Background, looked for links between the Consumer Interaction Study and utility industry experience.

During the study, consumer response to a particular question of the moderator may contain insights related to a different aspect of consumer engagement, education, understanding, or technology. Therefore these consumer responses were evaluated according to the content of the consumer statements as opposed to categorization by the question asked by the moderator.

The discussion below identifies several consumer disconnects along with observations that tie several responses together relative to the current smart grid environment and knowledge of electricity use in general.

Note that there is room for discussion about how the qualitative data should be processed relative to the observations below. However, when listening to customers, we must listen for what they meant and look for motivations and potential misunderstandings behind their responses. In doing so, we try to extract the buried nuggets of information.

In this way, this section offers observations from the customer responses that extend the learning beyond the pure consumer participant data. The EPRI team recognizes that this may not represent an exact science, but rather observations that, by their nature, could be challenged. Yet the team asserts that these perspective-based observations should be offered for consideration. A disagreement regarding the observations documented below could simply indicate where further consumer study is needed to bring additional clarity. The discussion below is purposed to offer observations that may take us closer to uncovering the keys to consumer understanding and ultimately engagement of the utility consumer.

When participants were asked about their energy usage, they offered numerous responses and reasons for what they felt were the primary uses. The participants applied their own logic to tell us that their computer uses the most, or their microwave, their refrigerator etc. Some of the participants had heard that certain devices use electricity when they are plugged in, but not being used. Therefore there was an assumption that this stand-by power could represent a significant part of their bill. When asked about energy saving efforts, participants mentioned a variety of things, some of which were accurate while others would not likely make an observable change in their monthly bill.

Mention of air conditioning, reducing outdoor flood lights, changing to CFL bulbs, doing laundry evenings and weekends etc. could be accurate although there are

dependencies on a few variables. But the participants who thought reducing their microwave use would show up on their bill or that unplugging a few devices when not in use may be spending effort and inconvenience on items of minimal or undetectable financial impact.

Consumers would highly value energy consumption/cost information broken down by circuit or appliance.

An interesting observation is that stand-by power (referred to in consumer terms as unplugging devices when not in use) received media attention in recent years. Motivated by the overall cumulative savings generated nationwide, consumers may assume they could see a measurable impact on their bill by following this advice. Yet unplugging 5 watts of standby power for 8,760 hours (one year) results in ~43 kWh/year. If we assume 14 cents per kWh, that is \$6.13/year or roughly \$.50 per month. While the aggregate result is significant on the grid, we have to understand how this national campaign may have caused a consumer assumption that they will see a measurable difference in their monthly bill when, in fact, it would be very difficult to detect. If a consumer unplugs a few power supplies and their next month's bill happens to be less, for a variety of other reasons, they credit their actions for the difference. If not, they get discouraged and become disengaged. Either way, it could lead the consumer in the wrong direction.

Consumer frustration may be increased by making ineffective changes that do not impact their bill.

In the ESB Networks pilot (part of the EPRI Smart Grid Demonstration Initiative) a survey determined that 59% of the customers who gave up on shifting energy from peak to off-peak selected the reason "We tried to reduce but the bill seemed to be the same so we gave up."

Another response tracked in the same program indicates that 15% of the queried customers gave the same response when asked about switching to night usage. This invokes the assertion that customers may have inadequate information and make incorrect assumptions about what uses the most energy in their home. Consumer frustration may be increased by making ineffective changes that do not impact their bill.

Customers may assume that since a particular device is known to draw a lot of power, changing the use of that device will impact their bill. Perhaps this verifies that consumers do not understand the difference between kW and kWh. An example of this is the microwave. It may use 1,500 watts. But the kWh over a month's time is so small that the monthly impact on the customer bill is actually very low. One pilot measured the average microwave impact on the bill at roughly \$0.25 per month [5]. Similar examples could be drawn from a number of the consumer assumptions about the sources of their energy consumption.

An interesting observation that resonated with both groups of participants was the idea of knowing how much each device (AC, Appliances, TV, etc.) contributes to the monthly electric bill. These participants appeared to assume that if they are getting more information about how much energy they use, when they use it, and how much it costs, it will be broken down (sub metered) by appliance, circuit or device. Their follow-on remarks tended to build on that assumption to the extent that we can feel relatively confident in stating that consumers would highly value energy consumption/cost information broken down by circuit or by appliance. This would tend to support a conclusion that a whole-home energy display may not provide what consumers would consider as actionable information.

4.2. Sources of Information

When participants offered their sources of energy information, there was a noticeable difference in responses in the week one ("awares") group, who had previously heard of the smart grid, and the week two group ("unawares"), who had not heard of the smart grid. As perhaps we should have expected, the results seem to indicate that the aware group may be a segment who not only spend more time reading, but also appears to reference a broader set of information sources. The awares group of participants included sources such as science publications, discovery channel, CNN, National Geographic, various magazines, the Wall Street Journal and others in addition to the internet.

Since the consumers in the week two group (unawares) were not previously aware of the smart grid, they were asked where they would expect to learn this type of information. These participants offered a broad range that included a media campaign, ads, direct mail, their electric bill, the utility and the utility web site. The unawares listed sources that would tend to grab their attention as opposed to the aware respondents who listed articles they purposefully read on a regular basis, perhaps just to stay in touch with current affairs. In contrast, the unaware group tended to seek out more common sources of information.

4.3. Reasons to Save Energy

The participants in both week-long interaction sessions mentioned saving money on their bill as being their primary reason to save energy. Environmental concerns came in as a strong second and were also described as a “social responsibility”. An interesting observation is that toward the end of the week when asked to prioritize a list of motivations, “Reliability” seemed to rise higher in the list. The reason is difficult to ascertain and it seemed stronger in the unaware group. Below are two possible explanations although we recognize there could be others and this study did not attempt to resolve this issue:

1. Once consumers achieved a good understanding of the smart grid, the reliability aspect of a modernized grid appealed to them. Perhaps this was a result of a better understanding of smart grid technology.
2. It could be a case of a group dynamics reaction where participants follow the lead of one participant who ranked reliability higher in one of the first responses read by the other participants.

In either case, we can consider the possibility that enhanced reliability is something that may warrant further study as a consumer motivator.

4.4. Consumer Perspectives on Updated Smart Grid Technology

The aware group, since they already had some knowledge of the smart grid, was presented a question to determine if their smart grid knowledge was accurate. Generally speaking we found that the aware group had a reasonable understanding of smart grid technology. Information volunteered included reference to predetermining energy use, preventing overload and blackouts, using computers to monitor the grid resulting in less or cheaper power, efficiency, adjusting the supply, instrumentation to eliminate waste, increased reliability, efficiency and safety.

Since the unaware group had little initial understanding, they were instructed to seek information about the smart grid. This also resulted in reasonably accurate learning and they quickly came up to speed in the discussion with a basis of knowledge by seeking it independently from sources of their own choosing. This second group mentioned findings including services, updated home electronics and updated components of the grid that will increase reliability.

This left the impression that fairly accurate information is available to consumers who are well read or seek the information. Note however, that the issue of data usage and privacy also surfaced which indicates the impact of available information of all types and sources that is readily available to the public.

4.5. Customer Terminology Observations

The research team kept an eye out for terms or phrases the consumers used, liked, or identified with. These may have been noticed during any part of the interactions. Although the specific terminology or phrasing varied, several concepts seemed to resonate. One example was providing consumers with greater information. If customers are told they can impact the system and manage their cost, they want accurate information. It was clear from this group that having information on what each of their personal home devices is using and costing was considered essential. A distant second was significantly reducing the environmental impact of the whole electricity supply system. When given the priorities, cost savings was always first. But the second was consistently environmental.

The idea of having enough information to make educated decisions on how to reduce energy and save money resonated well. This seemed to give the grid technology a customer focused identity. One participant also thought the additional usage information would give consumers the feeling that the technology could make their life easier instead of only helping the utility.

Fairly accurate information is available to consumers who are well read or seek the information.

4.6. Definition of the Smart Grid

The EPRI team made multiple revisions to crystallize a definition of the smart grid that is consumer focused. The definition, in Figure 1, was the result that was presented to the consumer interaction group for discussion and critique.

General response to the definition was positive. Comments on the proposed definition indicated the statements were clear, concise, and consumer focused. Several participants indicated that the statement created interest and they wanted to know more. This was an interesting response since, in creating the definition, the EPRI team struggled to reduce the size of the definition and realized that detailed information could not be included while keeping the size reasonable.

As noted earlier in this report, many participants latched onto the phrase “*know how much electricity they use, when they use it, and how much it costs before receiving their monthly bill.*” This is interesting considering that the consumer adoption of the in-home displays have not always met utility program expectations. We must consider this as a possible disconnect between what most pilots have provided and the detailed information study participants would consider to be most engaging. One participant commented

that with the technology they could *“have more of an active role in managing my energy usage, costs, and conservation.”*

Although most of the responses were positive, several consumers indicated that more information or different terms may be helpful. The term *“robust”* was mentioned as a term consumers don’t connect with and that the term *“grid”* is not a consumer focused term. Several participants would like to see specific examples of how consumers have saved energy and seemed to indicate that although they liked the definition, wanted some proof via clear and accurate examples.

4.7. Customer Benefits

In a discussion of benefits, the additional energy and pre-bill information seemed to resonate with participants. Removing the emotional worry over high electric bills was emphasized since they could know their cost ahead of time and manage accordingly. Although the environmental impact was not at the top of the list, several consumers made the connections along with some notable observations such as: *“I would be a player and not just a spectator in this electricity game.”* As noted earlier, the sub-metered information resurfaced a number of times in the remainder of the week once the definition was presented. One consumer stated: *“Having this information would allow you to make the choices you are comfortable with while being aware of the consequences be they environmental or financial.”*

4.8. Consumer Concerns & Data Privacy

The awares group seemed to bring along more concerns about data privacy. Although the topic came up in the unawares group, the aware group had obviously come across this issue prior to the study. Key concerns were related to information being gathered and sold to other organizations to determine household occupancy or penalize customers for their energy consumption habits.

The participants quickly realized that other data sharing and tracking concerns are much more significant than what could be tracked via a smart meter

The first group seemed to have difficulty letting go of this previous knowledge although in both groups, there were those who voluntarily responded to those with privacy concerns with statements such as *“For me, the pros outweigh the cons, and I would seriously consider using this technology.”*

Several participants offered a comparison with the data and data privacy of smart meters with that of data obtained by other organizations such as Facebook, Paypal, smart phones, credit cards and online banking. Leveraging this opportunity during day four of the unawares week, the EPRI team requested that the moderator ask participants to compare the risk of data gathered from the smart meter with the other organizations and types of tracked data as far as privacy and security concerns. When offered this comparison the participants quickly realized that other data sharing and tracking concerns are much more significant than what could be tracked via a smart meter. Typical responses included: *“This type of information to me is not really anything I would need concern over. It’s not that it’s personal or relevant to my bank account numbers, social security number, credit card numbers, etc....”* and *“In reality, what information could they gather from my energy usage (amount used, times of high usage) that could be detrimental?”* Although one or two customers still had privacy concerns based primarily on principle, the majority of participants seemed to simply let go of this issue when offered the comparison. The project team had planned for a larger survey follow-up to validate findings in the interactive study. The team selected this issue for follow-up. The result was that when presented with a list of privacy concerns, only 4% listed smart meter data privacy in the top three. Further information is presented in Figure 8.

Although the project team hesitated to approach the application of this particular data comparison experience, there was discussion about this as a key to creative design of customer engagement material. Devising a simple way to invoke this type of comparison in the mind of the consumer may help them put into proper perspective the concerns over data privacy.

While customer adoption was not a specific discussion topic, many comments were logged that relate to consumer willingness to adopt smart grid technology. A key observation was that in the study, participants first learned about smart grid technology before addressing additional issues. Once the moderator had observed their learning process, further questions uncovered various statements indicating a level of adoption.

If consumers have an incorrect understanding of where their energy is consumed, they will make incorrect choices and feel frustration in making changes in response to any type of energy pricing program.

A focus on education first, could be a consideration in the design of a consumer engagement process. Perhaps the education focus should be kept independent of program enrollment. Once consumer interest starts to turn into a request for more information or involvement, then a program introduction would be appropriate. In this study, once consumers started to grasp the smart grid concepts, we received some rather straightforward statements of readiness for the technology. For example the statement “*I would love to really see what is sucking up most of my energy usage and knowing that will allow me to think of ways to save energy and money*” was volunteered after the participant gained an understanding of basic smart grid concepts.

For someone involved in sales, this type of statement may be referred to as a “buying signal”. The consumer has made a statement implying acceptance and is ready to move onto the next step of committing to the product or service being discussed. For consumers motivated by environmental and community concerns, another statement worth noting was: “*Smart grid means conserving resources and being aware that I am part of a larger community that doesn’t just involve me.*”

4.9. Miscellaneous Observations and Comments

Comparing the aware participants with the unaware group raises several observations. The awares tended to hold on to what they had already learned. These participants had some well established opinions on the smart grid and seemed more difficult to focus or refocus on additional or differing information. The unawares appeared to be willing to be educated and, once they understood the smart grid, were eager to proceed into the rankings, issues and terminology discussions.

Participants in this study, like most other studies, tend to rank the energy consumption of their home appliances and electric consuming devices incorrectly [6]. In addition consumers may not realize that certain products will fall into a different ranking due to individual usage patterns and the type and model of the products owned, its age, and the number owned. It only seems logical to assume that if consumers have an incorrect understanding of where their energy is consumed, they will make incorrect choices and eventually feel frustration in making non-impactful changes in response to any type of energy pricing program.

Where consumers would expect to obtain information about smart grid technology or programs overlap. For example, where consumers learn about a program and where they would like to receive pricing information may both include email and text messages. There are some consumers who definitely do not want unsolicited email or text messages while some others feel this would be ok and a few others who would not be accepting of either method for any purpose. One consumer stated it well: “*It might be*

beneficial to offer the option of how to receive information; offer a variety of options, and then for the text user ask how many texts per day they want to receive and/or what they want to be notified about. Ask what time of day they’d like to receive the text.”

There is a ranking of consumer choices of education methods listed in the Itron-sponsored article that offers similar information. In figure 32 of that article [7], consumers ranked survey items such as mailed materials, email from their utility, commercials etc. The list extracted from this EPRI study method may offer additional educational considerations or sub-groupings of educational sources to consider in conjunction with these other findings [8].

Even though participants in this study, for the most part, became engaged in the topic, there seemed to be an element of what could be termed “cautious optimism”. One consumer statement seemed worthy of having the last word. This statement could be interpreted a number of ways ranging from a hint of negativity through cautious optimism or even a sign of being ready to adopt the programs and technology of the smart grid:

“Saving money on your monthly bill, Whenever I see this statement, I know I am going to need to make changes somehow. So my question is, ‘Are these changes reasonable?’ “

5. TOPICAL BACKGROUND RESEARCH

The examination of prior research and related projects and pilots was conducted in order to address the following research topics: 1) the motivation for adoption of smart grid technologies and programs 2) the problem being addressed or opportunity pursued with smart grid technology, and 3) identifying the logical steps forward for engaging the customer and other interested parties with a common industry message. This section is organized by these three topic areas and also explores potential barriers to customer engagement and key findings from the literature review. Several sources include press releases or report excerpts rather than full surveys, which makes it difficult to know the exact rigor that was used in the development, implementation and analysis of the results. The studies referenced throughout this section that are of interest should be examined in greater detail by the reader.

5.1. Customer Motivators

The first main area of focus centered on consumer motivators by asking the question: What are the key drivers that would motivate the consumer to use smart grid technologies in their home? In order to determine these key motivating factors there needs to be an understanding in regards to what/who influences the consumer’s energy

decisions, where they get their information, and ultimately what benefits they expect to gain.

5.2. Influence and Perceptions

Gaining customer acceptance and participation in smart grid programs should start with knowing your customer base. Identifying the influential actors in the community and other sources of information that consumers turn to, to better manage their energy use should aid electricity providers in developing a successful smart grid program. Various studies have been conducted regarding who the customer trusts for energy efficiency information. The results of these studies are diverse.

According to a survey conducted by the Edison Electric Institute in early 2010, the majority of consumers (55%) looked to their electric utility for efficiency information, 25% looked to retailers such as Home Depot, while 20% looked to the Federal government [9]. A study by Accenture surveyed 9,108 individuals across 17 countries in order to understand consumer opinions and preferences in regards to energy management. When asked who the first choice would be to get general information on electricity management programs, 53% chose the electricity provider. The second preference for this information was consumer associations with 15% of the responses. However, when asked which organizations they trust to inform them about optimizing their electricity use the respondents ranked environmental (53%), academic (51%) and consumer organizations (49%) first with the electricity provider receiving only 29% of the responses as a trusted advisor [10]. A Boston Consulting Group survey found that the majority of consumers (78%) are interested in the power company providing an in-home solution for monitoring data via a smart meter with 37% very open and 41% somewhat open to the utility being a provider for these monitoring options. The second and third preferences selected by respondents include General Electric (70%) and Microsoft (67%) [11].

A grassroots model for outreach as discussed in the Smart Grid Consumer Collaborative (SGCC) State of the Consumer report appears to be an effective channel as there tends to be a high amount of trust in community based organizations for objective advice as many of these organizations have already built relationships with those in the community. This makes the grassroots model a potentially valuable approach to outreach and education [12]. A pilot conducted by San Diego Gas & Electric revealed that being collaborative, proactive, responding immediately and being transparent when issues arise contributed to success of their smart meter program. Key accomplishments of the program include installation of 98% of the 2.2 million gas and electric meters, fewer than

3,500 complaints (.16% of the total installations), less than 180 customer refusals of meters and no city or local government moratorium against smart meter deployment in the service territory [13].

One aspect of program design that appeared in various reports is to not only engage a diverse mix of stakeholders from the start, but to engage those who are critical of the smart grid. Getting to the root of their concern and working to solve the problem in a collaborative fashion is one way to be proactive and work to gain the trust and support of those who you may have otherwise had to compete with. Recognizing the opportunity to coordinate with those individuals or organizations the consumer trusts for information, may help to decrease the amount of false information dispersed to consumers and increase the trust of the electricity provider in the mind of the consumer as these partnerships are cultivated.

5.3. Level of Awareness & Engagement

Building on this approach to understanding the consumer influences and sources of information to motivate adoption of smart grid technologies there should be an understanding of the current level of awareness in addition to an understanding of the current level of consumer education in regards to energy conservation.

It is difficult to expect the consumer to fully understand the smart grid if the communications provided outline benefits in a way that do not resonate with the consumer. Several studies suggest that basic energy usage education is needed for consumers to fully realize the benefits of the smart grid. Basic education implies the absence of unfamiliar terminology and an approach that is simple. According to a report by Accenture there was a noteworthy contradiction between the consumer perception and accurate knowledge in terms of the most effective methods of energy conservation [14]. These contradictions were also found in the consumer interaction studies discussed in Consumer Interaction Study and Grid Perspectives on Consumer Interactions.

In a study conducted by IBM 30% of respondents were unaware of the basic unit of charge for energy consumption (cents per kWh) [15]. A whitepaper produced by Southern California Edison stated, "Numerous studies have confirmed that consumers prefer energy information quantified in monetary terms rather than electrical terms like kilowatt-hours." [16] Stacia Harper of Ohio Partners for Affordable Energy on a webcast held by the SGCC summed it up well by stating that consumers do NOT think in terms of kWh's [17]. The Accenture report cited above went on to suggest that utilities need to actively promote education programs to eliminate this contradiction through multi-tier awareness and the inclusion of multiple stakeholders [18].

Given the complexity of the energy ecosystem, meaningful consumer solutions that go beyond monetary savings will only be realized if non-traditional partnerships are developed to deliver meaningful end-to-end energy management solutions with a clear consumer benefit.

(Source: Best Buy)

The SGCC report builds on these findings by reporting that there is a knowledge gap between a consumer understanding the language behind a program or incentive and the consumer actually seeing the value. The example used by the SGCC is that of the computer age. Most people do not know the interworking of a computer, but consumers learned to use computers because they understood the value in the products and services it provides. The majority of consumers are probably not interested in the technical details that comprise the smart grid, but if basic education can be provided and the value of the technologies capabilities communicated the level of engagement may be improved.

Several studies have also been conducted on the consumer awareness of smart meters and the smart grid. The IBM study found that 50% of respondents did not understand time of use pricing, and 60% did not understand the term smart grid or smart meter [19]. According to an Ecoalign survey customer awareness has barely budged over the past year, with 35 percent of Americans being aware of the phrase “smart grid” in 2011 compared to 31 percent in 2010 [20]. A phone survey was conducted by GE with 1,000 respondents in May of 2010 where 79% of respondents stated they were not familiar with the term smart grid, and 4% had heard of the term and/or had a good understanding of it [21]. A survey sponsored by Itron echoes these findings where only 39.3% of the sample said they were aware of the smart grid. In Zpryme’s Home Energy and Smart Grid Survey only 18.5% of respondents said their utility has provided them with information about the Smart Grid [22].

In terms of customer adoption or willingness to adopt smart grid technologies there are positive signs once awareness is raised. A survey conducted by IBM revealed that, “Customers who were most knowledgeable were 42% more likely to have a positive opinion of local deployment

programs underway or proposed, 51% more likely to believe that these programs would bring benefits to their family, and 64% more likely to change energy usage patterns to meet specific goals.”[23] A theme that emerged from a survey conducted by the Boston Consulting Group suggests that “Consumers generally believe in the potential for smart meters to help them reduce energy consumption but need to be further educated about reliability, privacy, and pricing.” [24]

Consumers need to understand the bigger picture and concrete implications of using smart appliances to be motivated to adopt them. (Source: Intelligent Energy Europe. Consumer Acceptance of Smart Appliances. (pg. 38).

Laurence Daniels of People’s Counsel in the District of Columbia discussed their PowerCentsDC™ program on an Intelligent Utility webcast in December of 2010. When discussing what was learned about consumers, Daniels listed early and continuing education, that the consumer wants to be informed and supported throughout the process and that consumers have diverse motivations and responses to smart grid technologies and dynamic prices [25]. Terri Flora, Director of Corporate Communications for AEP in Ohio discussing their gridSMART® Project, acknowledged that they made strides in establishing the “Me Next” movement meaning AEP Ohio customers in other areas of the service territory were requesting smart grid technology [26]. Efforts to educate the consumer through these pilots mentioned as well as others echoes a key driver for a successful smart grid program, that is, informed consumers make informed decisions.

Figure 9 illustrates the potential steps in the process a consumer goes through from the influence and awareness of smart grid technology to an understanding and motivation to take action.

5.4. Motivation & Expectation

The economic, environmental and social motivation to conserve energy all seem to have traction when presented in a way that resonates with the consumer. The consumer motivation on the economic side would of course be to reduce the electricity bill. An IBM study revealed that economic incentives are still the prime motivator for adoption, but other areas including environmental factors, group validation, energy independence, and strengthening the country’s economic future are gaining ground [27]. In

addition to cost savings, environmental motivators may be reduced green house gas emissions, importance placed on conservation of resources, and even making the connection in terms of improved air and water quality and therefore promoting a healthier environment to live in. Based on our research the social motivation also seems to have potential. For example, the OPOWER home energy reports that compare your consumption to your neighbors have shown to reduce energy demand by 1.8% on average [28]. Another social motivation is simply that you are doing the right thing. The basic idea that the consumer is going to have more control over their use and ultimately the cost of their electricity bill is also a motivation. Cost savings, increased information and control, and improved effectiveness of efforts to conserve were also found to be prime motivators for the participants in the consumer interaction study discussed in Consumer Interaction Study and Grid Perspectives on Consumer Interactions.



Figure 9. Potential Process from Awareness to Action

The consumer expectation, however, emerged as a common theme that deserves attention and further study. Communicating the specific benefits of the smart grid from the consumer perspective is needed. Several reports identified the importance of providing timely and accurate benefits assessments for consumers from the start. The Smart Grid Consumer Collaborative report stated, “The research supports that Smart Grid technology can mitigate increases and leverage consumer behavior changes as a significant supply resource. However, consumers are developing high expectations about how much can be saved.”[29] There has also been a call by several consumer advocacy organizations for a robust cost/benefit analysis and review to ensure that consumer benefits are delivered as promised [30].

5.5. Understanding the Problem

Demonstrating the value of smart grid technologies to the consumer is central to developing demand for these

technologies especially with minimal impact to the consumer’s lifestyle. Understanding the common consumer concerns and gaps or disconnects in communicating the value were identified as a second topic for review.

5.6. Common Concerns & Potential Barriers

Common consumer concerns in regards to the capabilities of smart grid technology include the cost they will incur whether directly or indirectly, as well as privacy and security concerns. Several research gaps include understanding different market segments of the customer base, long term adoption rates of these technologies, and documentation of a full benefits assessment from the customer perspective.

5.6.1. Why Does the Utility Want to Save Me Money?

This is a question that has been asked by consumers and should be addressed as part of smart grid consumer awareness programs in addition to the questions in Figure 10 [31]. The results of a recent Itron survey revealed that “The highest rated potential benefit of the smart grid was saving money. However, the biggest concern was the cost to build it.” [32] Consumers will probably not make the connection on their own that the high cost of maintaining and operating power plants, especially peaker plants, may be outweighed by the advantages of collective energy efficiency measures for economic and environmental reasons. This disconnect was also identified among some of the consumer interaction study participants. Information that clearly describes the utility’s motives should be communicated in a way the consumer understands.

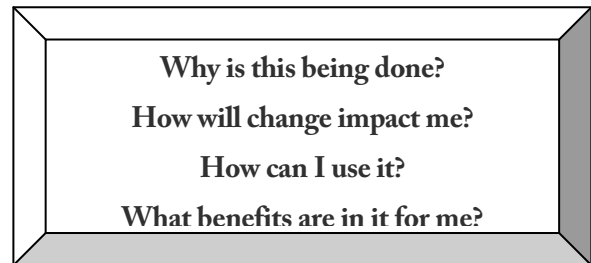


Figure 10. Common Consumer Questions on Smart Grid

5.6.2. What Happens to My Information?

Who owns the consumers information is another question that should be clearly communicated. Risa Baron of San Diego Gas & Electric cited privacy as one of the main concerns expressed by consumers during their smart meter deployment. An Ecoalign survey conducted in 2010 asked who should have access to customer information with 64% indicating only the customer [33]. In a study conducted by IMS 38.1% of respondents cited “control” as the main reason they would not participate in demand response programs (the survey did not use the word control when

providing an explanation of demand response) [34]. An Accenture study echoes these findings stating, “while price remains a key factor to adoption, the extent of the utilities/electricity providers’ control over energy use has emerged as a potential barrier.” [35]

Several gaps in communicating the value to the customer were identified from a utility perspective as questions that should be addressed or further researched. These include a general lack of knowledge of the customer motivation by customer segment, the long-term adoption rates of these technologies and an in depth benefits assessment from the customers perspective. Understanding the consumer motivation is important because a lack of customer interest translates to a delay in product manufacturers seeing the value in implementing the technologies if they are not widely used and/or potential regulatory delays if benefits are not properly presented to the consumer. The utilization of traditional market segmentation techniques in regards to technology adoption and energy conservation has been studied and a variety of customer categories have been identified. The one aspect that these studies have in common, however, is the view that there is no such thing as the “average customer.” Another disconnect that should be addressed is how to keep the mainstream population engaged in these technologies for the long-term, a term known as persistence. There are many potential benefits of the smart grid that have yet to reach the consumer view. The increase in information gained from \$338 billion to \$476 billion in investments in U.S. grid modernization will yield \$1.3 trillion to \$2.0 trillion in benefits from 2010 to 2030 [36]. The specific benefits (monetary and otherwise) that the consumer may see from the smart grid should be broken down and clearly presented.

These potential barriers as well as opportunities reveal the importance of communicating the full value and capabilities of various smart grid technologies and applications. One way to present this information may be to illustrate how the consumer’s relationship with their electricity consumption would look under a “do nothing” scenario versus with the smart grid.

5.7. Common Industry Message

Serious consideration of the first two research areas (Motivation and Understanding the Problem) leads into the idea of engagement through a common message which is achieved through collaboration and carefully selected methods of communication.

5.7.1. Collaboration & Communication

Customer expectation in regards to benefits should be communicated through both education and marketing channels. Definitive Insights surveyed over 1,100 residential energy decision-makers and found that a “key marketing

challenge will be to find ways to reassure customers about how and when they will see the promised benefits.” [37]

Communicating with the customer where they feel comfortable and would be easiest to reach is also important. Communicating early and often through multiple channels of communication and responding quickly and personally to consumer questions is important to strengthen the participation rates for these programs. An IBM study found that the main influence for communication are bill inserts, however, the study also found that traditional media and internet based communications in aggregate outweigh the previous method [38]. Forty five percent of respondents from an Itron study said they preferred to be educated about the smart grid through visual presentations such as video, online or on T.V. as well [39]. These are examples of direct methods of communication with the consumer; however, the reality is that these are not the only communications that a consumer may receive in regards to the smart grid. This makes misinformation one of the greatest enemies to success. The opportunity for increased innovations is numerous and the range of industry that can play a part in the transformation of the electric grid is diverse. Identifying opportunities for collaboration and capitalizing on them will accelerate the development of a common industry message by engaging a diverse mix of stakeholders such as departments within city government (i.e. planning and transportation department), local schools and universities, local media, community organizations and events, as well as third party providers. Michael Chesser, CEO of Kansas City Power and Light, has suggested that utilities need to develop working relationships with all of these organizations to take advantage of these diverse interfaces.

5.8. Key Findings & Conclusion from Background Research

The transformation of the electric power grid is a global endeavor. The national imperative to modernize and enhance the power delivery system in the United States is reflected in the Energy Independence and Security Act (EISA) of 2007. The Act expresses the responsibility to move forward with this grid modernization and the importance of providing consumers with accurate information. The European Union has also released several directives in response to the grid transformation including the “Energy 2020 strategy,” with a goal to achieve 20% energy savings by the year 2020 including providing more choices and affordable energy options to consumers [40].

Several potential consumer trends emerged from the literature review. The centers of influence for consumers, in terms of energy information, vary as indicated from the studies cited above. In order to communicate that value it is essential for electricity providers to know their customers and to engage them through a diverse mix of stakeholders.

Engaging various stakeholders to promote a smart grid program or pilot is important to strengthen the trust of the consumer and assist in the distribution of accurate smart grid information. There is a need for simple and precise messaging as many consumers do not understand unfamiliar energy usage terminology, and as the studies suggest many are not yet aware of the smart grid. Common concerns and potential barriers that face the smart grid such as consumer cost and the extent of control by the utility that may deter consumer participation should be further researched. From a utility perspective it is important to understand the consumer motivation to adopt the technology, the long-term take up rates of these technologies and applications, as well as illustrating the value and capability of the smart grid and smart meters. There is a balance to be made between not over promising benefits, but also making sure the full value of the smart grid is realized. Communicating these advantages clearly and accurately to the consumer is imperative. The literature review indicates that once awareness is raised in regards to smart grid technologies and applications, consumers have many specific questions, which further begs the question; is the utility industry prepared to answer them? In order to take as many steps as possible to make the smart grid deployment successful, the program design and results should be transparent, verifiable, cost effective and in the interest of the customer in order to build and maintain customer trust.

Appendix A: Consumer Selection, Demographics, & Interaction Tool

Participant Selection for Interaction Study

Participants were screened and selected from a national database of candidates. A minimum of 30 respondents were recruited for two separate sessions. An oversampling of several consumers in each group accounted for possible consumers who could have later determined that they did not have adequate time to participate.

The group selected for week one were selected by screening for customers who, in one way or another, were aware of the "smart grid." Below are some of the responses received during the recruitment process for the aware group. The selection screen asked them to tell us what they know about smart grid technology:

- "A more efficient way of receiving electricity. The benefit of saving money by saving energy that goes in and out. Technology used to supply more reliable and efficient energy."
- "An electronic grid that predicts and adjusts electrical use in homes/areas for a more efficient and affordable use for energy. Predictive Model for energy distribution."

- "An electrical system that attempts to guess usage of electric and makes it more efficient. It helps how companies deliver the electricity to make it more efficient."
- "Utility Supplies keep track of energy usage in areas and use info accordingly to adjust level or energy they send out. Sharing energy in the areas that need it (like blackouts) and reducing in areas that don't need it."
- "An interconnected grid of electric resources where you have a meter in your house to regulate and conserve energy. It is connected to different electronics in your house and allows for shared energy and conservation."
- "A better way of conserving energy. Lower power bills. You put a box on appliances and electric company can regulate and the consumer can get credits for the energy they share."
- "Type of electrical grid that tries to depict and respond to electrical uses of suppliers and consumers. In essence, hopes to deliver more reliable and sustainable electricity. Helps consumer play larger role in conserving and using."
- "It's energy use that's anticipated using research studying patterns of use and anticipated usage. More efficient use and better value to the consumer."
- "The estimation of potential usage based on what you used in the past. Gives people more familiarity with their energy use and be more accurate. Switch to a digital system."
- "Computer controlled electric devices to increase energy efficiency."

The participants selected for the second week were not previously aware of the smart grid. Both groups were targeted to cover the demographics that included:

- Homeowners and renters
- Must be the person who pays the utility bill
- Primary or joint decision maker on matters regarding energy source in the home
- Mix of regions within the U.S.
- Mix of male/female
- Mix of ages (Minimum age of 25)
- Mix of income (Minimum household income \$35K)

The case could be made that the highest age (age 60) did not allow representation of the retirement age group. Finding participants in that age group who are candidates for an on-line interaction group is more difficult. Considering the

adoption time and expected time lags until full customer participation in the smart grid is enabled by consumer level devices with smart grid designs, a portion of this group will be in retirement. Perhaps there is room for additional research in the post-retirement age group if there is significant interest in learning more about that age group.

Participants received a small financial incentive for participation in the study. Below is a brief profile of the participants selected for this study:

Unaware Group –

	Gender	State	Own or Rent	Age
1	F	VA	Rent	32
2	F	MA	Rent	34
3	M	PA	Own	60
4	F	CA	Rent	31
5	F	MD	Own	45
6	F	NY	Rent	56
7	F	MN	Own	35
9	F	WA	Rent	30
10	M	GA	Own	41
11	M	KS	Own	49
12	M	NJ	Own	39
13	M	CA	Rent	29
14	F	NY	Rent	42
15	M	VA	Rent	55

Aware Group –

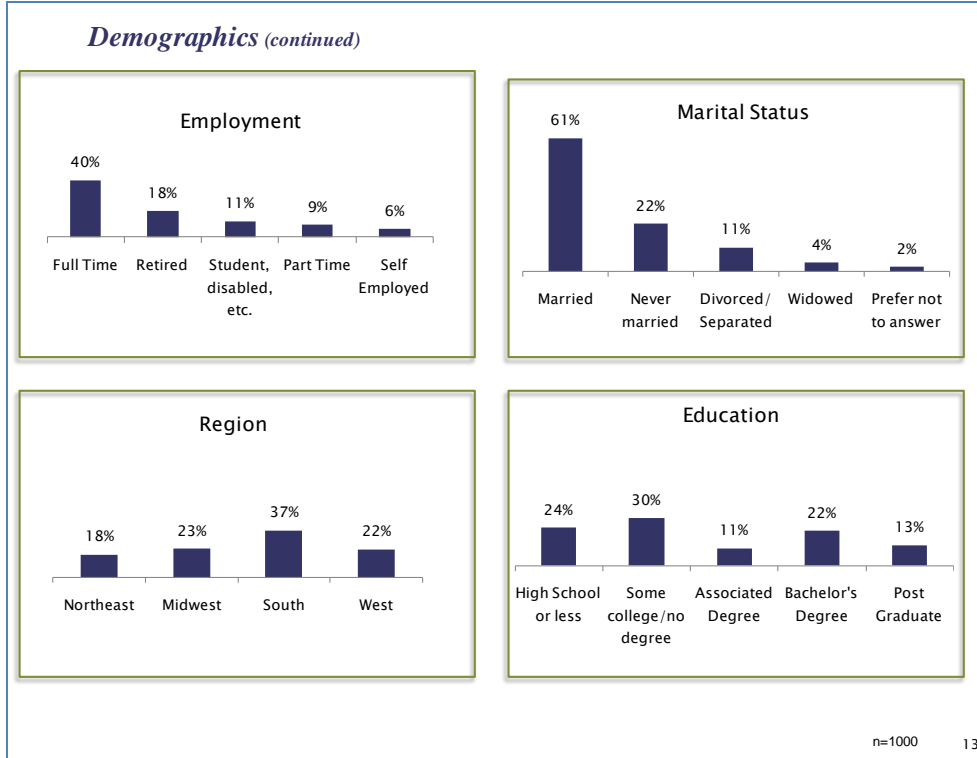
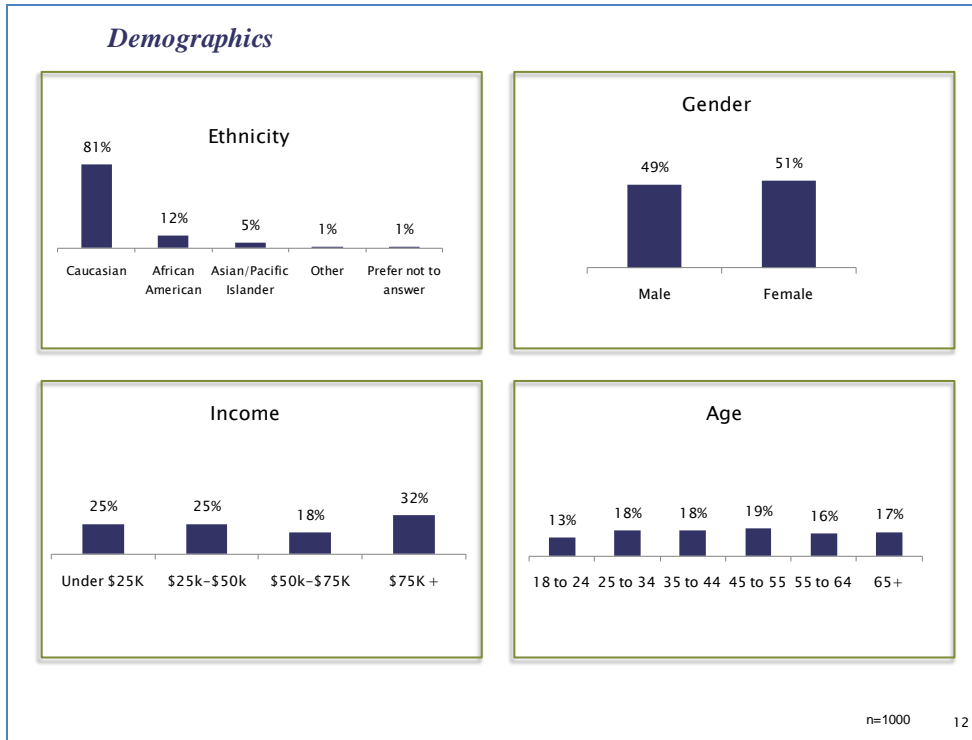
	Gender	State	Own or Rent	Age
1	F	GA	Own	46
2	M	NJ	Own	26
3	M	CA	Own	32
4	F	MN	Own	27
5	M	PA	Own	42
6	M	AL	Own	30
7	M	TX	Rent	36
8	F	FL	Own	44
9	M	WI	Own	51
10	F	NY	Rent	33
11	F	RI	Rent	37
12	M	NE	Rent	49
13	M	IL	Own	54
14	F	IL	Rent	29
15	F	NJ	Rent	40
16	F	TX	Rent	43
17	F	VA	Own	42

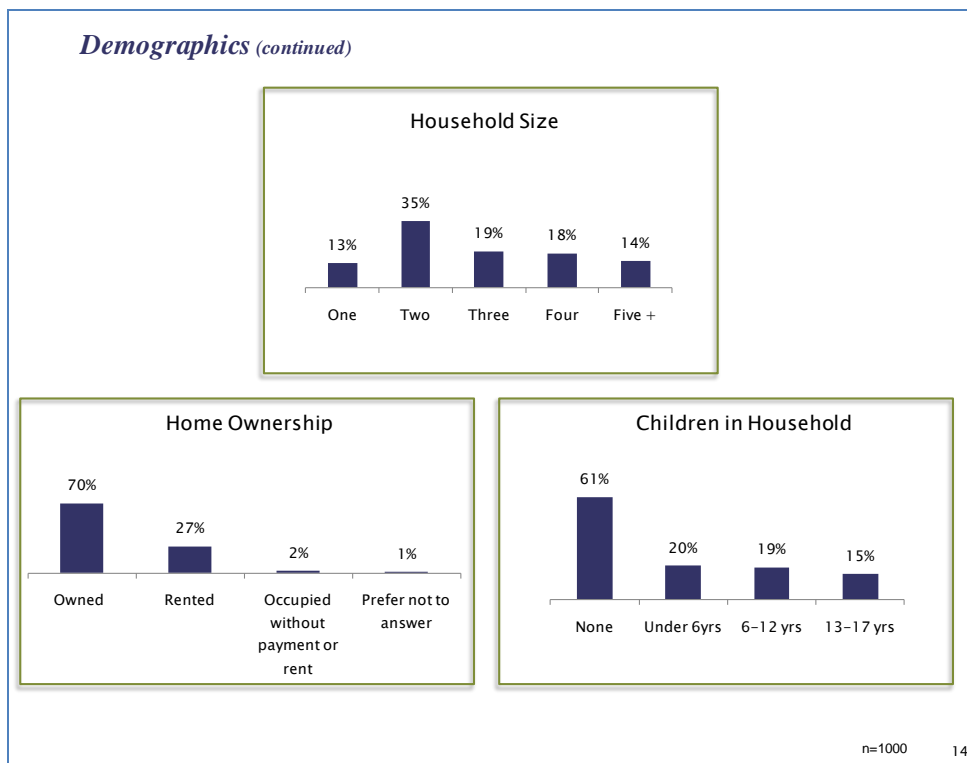
The iJot On-Line Consumer Interaction System

Participating consumers were required to log onto the system, via their internet browser, a minimum of two times each day. The moderator posted new questions or discussion items twice each day. Participants were able to view the responses left by the other participants and optionally respond in a linked chain format under a

particular discussion question or under a response left by another participant. Each discussion started a new list of responses under the discussion topic introduced by the moderator twice per day. The moderator could also ask follow-up questions to the group or to an individual consumer to further clarify a response. All discussion remained on line and accessible by the participants for the duration of the week.

Demographics for the 1,000 consumer follow-up quantitative study:





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