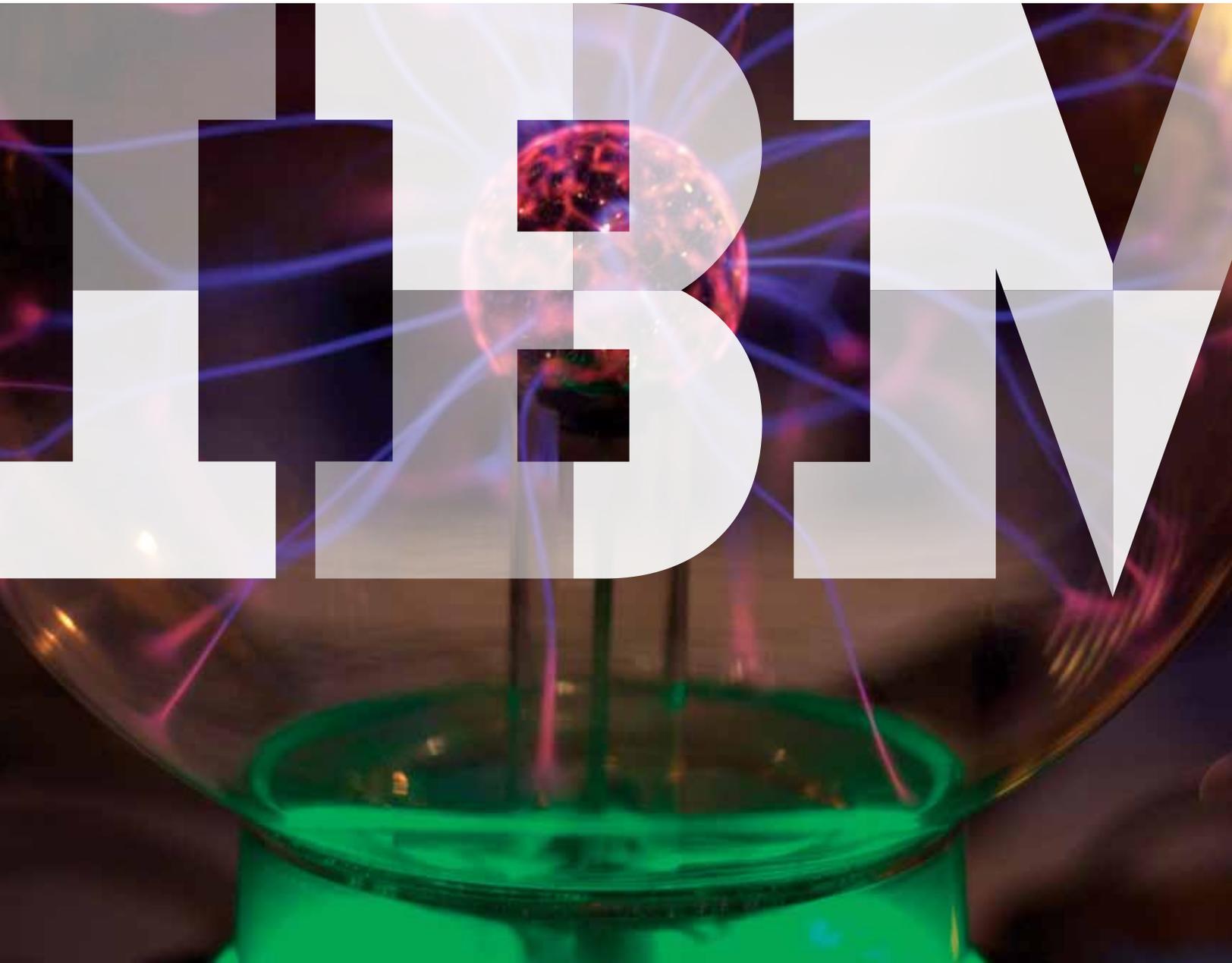


IBM Institute for Business Value

# Knowledge is power

*Driving smarter energy usage through consumer education*



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## **IBM Institute for Business Value**

IBM Global Business Services, through the IBM Institute for Business Value, develops fact-based strategic insights for senior executives around critical public and private sector issues. This executive report is based on an in-depth study by the Institute's research team. It is part of an ongoing commitment by IBM Global Business Services to provide analysis and viewpoints that help companies realize business value. You may contact the authors or send an e-mail to [iibv@us.ibm.com](mailto:iibv@us.ibm.com) for more information. Additional studies from the IBM Institute for Business Value can be found at [ibm.com/iibv](http://ibm.com/iibv)

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By Michael Valocchi and John Juliano

**Consumers have tremendous** expectations for future energy services. However, they are largely unaware that they need to take a more active role in managing energy decisions for their visions to become reality. In many cases, consumers lack even the basic knowledge necessary to accomplish this. Utilities and other smart grid advocates need to improve information transfer to consumers to build broader support and the customer engagement that can follow. Delivered through trusted and generation-appropriate channels, this information must address consumers' specific knowledge levels, most important motivating influences and current perceptions of providers.

Expectations have been running high for what smart meters and smart grid technology will provide to residential energy consumers in the long run. In the minds of consumers, gaining more control over energy use, improving environmental impacts and managing costs have been firmly associated with the term “smart grid.”

Communications and media coverage related to government economic stimulus packages and environmental priorities have played a role in building these perceptions.<sup>1</sup> Further boosts have come from consumer-focused magazines like one whose cover page featured “Extraordinary Solutions for a Clean-Energy Century” and lists like the one that ranked smart meters one of the top 20 green technology concepts.<sup>2</sup> Even the numerous consumer surveys focused on consumers' future energy wants and needs, including our own 2007 and 2009 Global Utility Consumer Surveys, may have contributed to expectation setting through questions about a future rich with data, tools for energy usage control, and new products and services.<sup>3</sup>

In the past two years, smart meter deployments have begun in some places and moved into final planning stages in others. In the process, this rosy view of the future often became clouded by uncertainty and confusion, driven by more imminent concerns and by influencers with a variety of messages. Some consumers are now raising questions: *Are smart meters really accurate? Is the collection of energy data a threat to my privacy? Will criminals know more about me and my family through my smart meter readings?*

What has been in many ways absent from the picture is the question of how people feel about the paths that would have to be traversed to get to an attractive future state where smart grids and smart meters provide improvements in energy use, environmental impacts and cost management. From our prior surveys, we know that consumers like the idea of having cleaner power options and more control and efficiency at their fingertips. But have they assumed these benefits would be accessible immediately once a smart meter was attached to their homes? Do they have sufficient understanding that, in order to optimize these benefits, changes in energy consumption patterns and more permission to access information about that energy usage might be required?

With questions like these in mind, we prepared our 2011 Global Utility Consumer Survey for launch to more than 9,000 respondents in 15 countries.<sup>4</sup> This time, our primary focus was not the compelling products and services consumers want to see emerge in the future. Similarly, we did not highlight useful energy efficiency actions they might be able to take with better technology and data. Instead, we sought to discover the key set of interconnections that define a consumer's current *expectations*: What *perceptions* are driving these expectations? How much underlying *knowledge* is behind the key perceptions? Finally, who or what factors are the strongest *influences* in developing that critical knowledge?

We found that the following factors contribute most strongly to an environment of long-term expectations conflicting with short-term reluctance:

- Consumer perceptions established early on – such as saving money and reducing environmental impact – remain strong, but energy independence and national economic benefits, among others, are now getting similar levels of attention.
- A newer perception – that of a privacy threat posed by the increased availability of energy data – has emerged strongly, shaping attitudes along several dimensions.
- Consumers' knowledge about their energy transactions with their providers is strongly correlated with perceptions that impact willingness to embrace smart meters and change energy consumption patterns.
- Despite its importance, the level of knowledge consumers have today about energy and their providers – even at the most basic levels – is unsatisfactory.

These factors are best explained in the context of a *consumer energy experience chain*, which recognizes that:

- *Expectations* are driven by *perceptions*
- *Perceptions* are created by retained *knowledge*
- *Knowledge* is retained in the context of core personal *influences* and passed on by trusted influencers.

More fundamental information must be provided to consumers to increase this knowledge base – but through both traditional and new influencers, and with specific messages and channels tailored to suit different age groups.

### **Perception: The first link in the consumer energy experience chain**

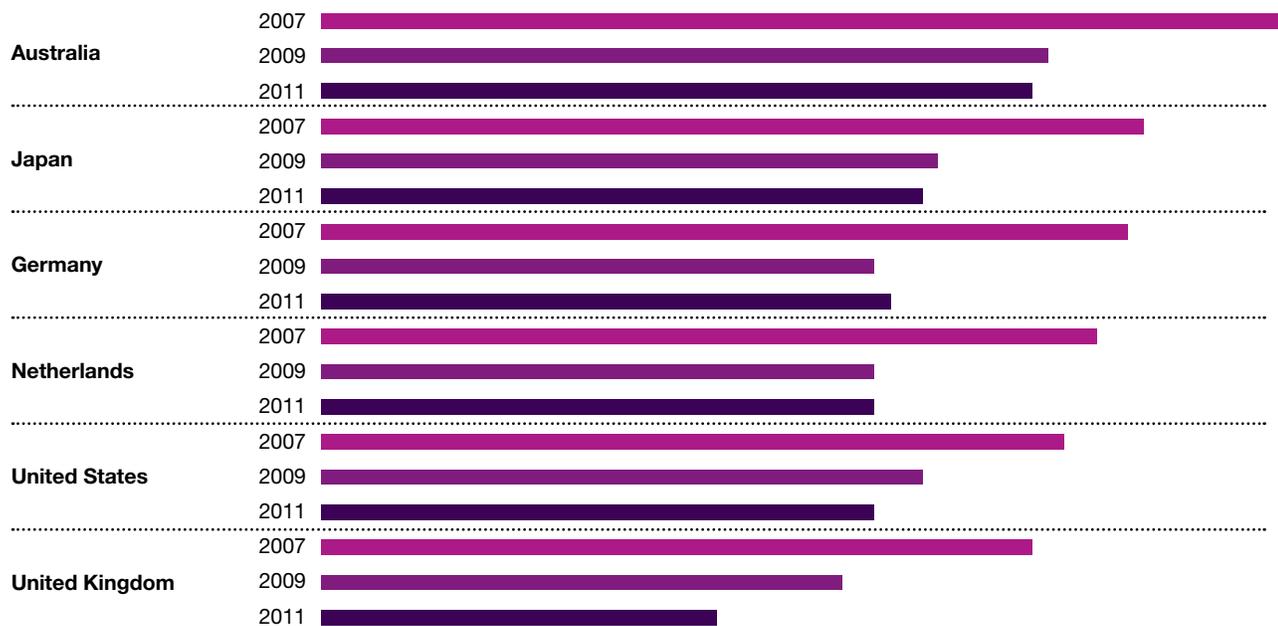
Reining in energy expenditures and mitigating the environmental impact of power generation have been the most prominent perceptions driving consumers' vision of benefits from the smart grid ecosystem. We noted these in 2007 when we conducted our first survey and reconfirmed them in 2009. By then, in fact, the impact of the global economic crisis strongly reinforced the emphasis on cost, particularly related to personal and family expenditures. See, for example, the drop in willingness to spend for “green products and services” (see Figure 1).

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*What has been in many ways absent from the picture is understanding how people feel about the paths necessary to get to an attractive future state where smart grids and smart meters provide improvements in energy use, environmental impacts and cost management.*

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**Percent of respondents that pay more for nonenergy-related environmentally friendly products (original 2007 group of six countries)**



Sources: IBM Global Utility Consumer Surveys, 2007-2011.

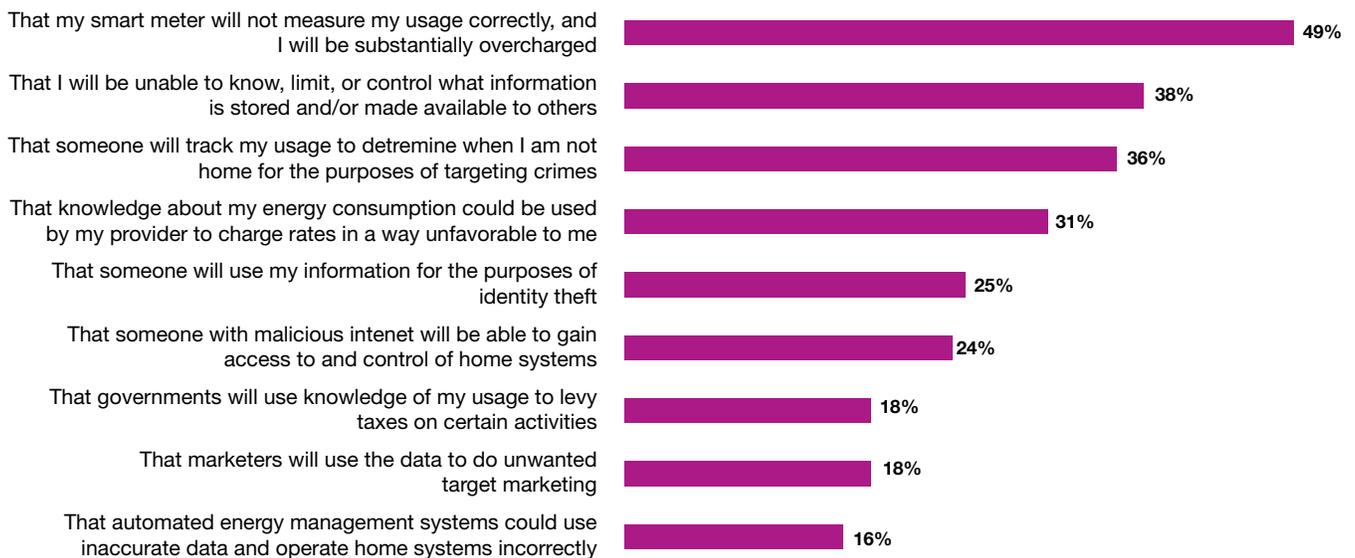
*Figure 1: After a sharp drop in the wake of the global economic crisis, nonenergy “green products” spending has stabilized in most countries.*

As 2012 begins, the influence of other perceptions is building. About 60 percent of our surveyed consumers with an opinion expect smart grid technologies to benefit their family and foster energy independence for their nations. Over half also believe that these technologies will improve household energy awareness and control, lowering total costs for household energy usage.

A relatively new perception that has become much more important to consumers over the past year relates to the data that will be generated by smart meters. Consumer concern about the wider availability of household energy usage data reflects a wide spectrum of issues. Among several options in our survey, the most frequently selected concern was erroneous readings resulting in overcharges (49 percent), followed by worries relating to the inability to know, limit or control what data is stored (38 percent, see Figure 2).<sup>5</sup>

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**Percent of respondents that rank specific risks related to smart meters and energy data collection in their top three concerns**



Note: Respondents selected three items, so percentages total greater than 100.  
Source: IBM 2011 Global Utility Consumer Survey.

Figure 2: Consumer concerns about privacy are wide ranging and represent various perspectives.

Two of the next three selected are concerns that have been publicized in the mainstream press related to crime and safety: that someone will track and analyze the data for targeting crimes (36 percent) and that someone will use the data for identity theft (25 percent). While the chances of smart meter data enabling robbery, burglary or identity theft affecting any individual are remote, the high level of concern about them indicates a need for better communication about the safeguards in place. (Another concern receiving notable media attention in some places despite being extremely low in probability – radiation and health safety impacts of smart meters – was identified as a top-three concern by only two of the 1,800 respondents.)

Proven measures to harden data security and protect personal privacy appear to be effective in reducing consumer concern about the availability of detailed energy usage data. Seventy-three percent of respondents would feel more comfortable with energy data transfers if they had assurance that attempts to access any home energy information devices and their data were logged to identify time and requestor. The same percentage would like to see processes in place that would enable consumers to access their own data and correct inaccuracies. Nearly 70 percent would feel safer if all information sent across domains (for example, from the consumer's home energy management system to the utility's operational systems) excluded all personally identifiable information from the data packages being transferred.

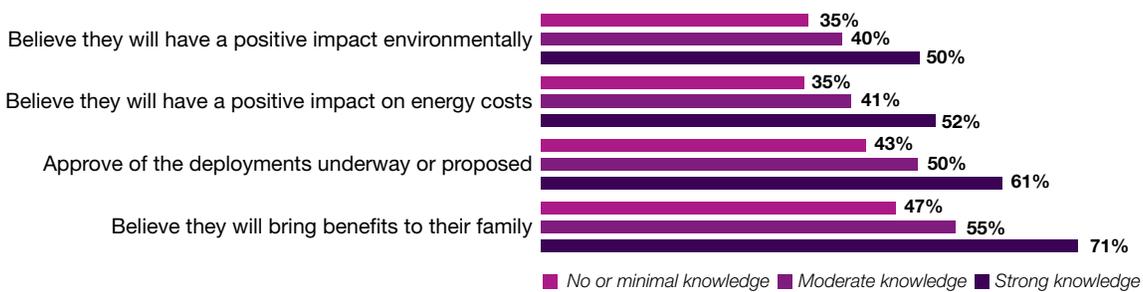
### A little knowledge is a good thing

Perceptions about new technologies and programs in general are driven in large part by the level of knowledge consumers have, and smart meters are no exception. There is a strong correlation between basic knowledge and willingness to change behavior patterns to meet broad goals (for example, help reduce peak demand by changing the time when energy is used). Similarly, overall approval of smart grid programs that are being deployed or proposed locally is directly related to the knowledge level of the respondent. For example, among consumers with very little knowledge of common industry terms, only 43 percent approve of technology deployment programs, versus 50 percent for those with moderate knowledge and 61 percent with strong knowledge. Similar correlations can be seen in responses to questions about whether these programs will benefit consumers' families and if they are likely to change energy use patterns. In fact, the

patterns were stunningly consistent for virtually all measures of a consumer's likelihood of positively embracing changes (see Figure 3).

However, this pattern is reversed where privacy is concerned. Here, the more knowledge consumers had about energy, the more concerned they were with privacy issues with home energy usage data. Less than a quarter of those with low to moderate levels of knowledge have privacy concerns; among high-knowledge respondents, the number is 38 percent (see Figure 4). However, the elevated privacy concerns do not adversely impact the favorability of these high-knowledge consumers toward new deployments and programs. The support for smart meter programs and data sharing among high-knowledge respondents who expressed privacy concerns was virtually identical to that of those high-knowledge consumers who had no concerns or a neutral opinion.

**Percent of respondents holding positive opinions of smart meters and smart grid deployment plans locally (underway, proposed or hypothesized)**



Source: IBM 2011 Global Utility Consumer Survey.

Figure 3: Higher levels of knowledge strongly correlate with increased belief that new technologies and programs will bring benefits.

**Percent of respondents who express a concern that smart grid/ smart meters pose a new risk to privacy**



Source: IBM 2011 Global Utility Consumer Survey.

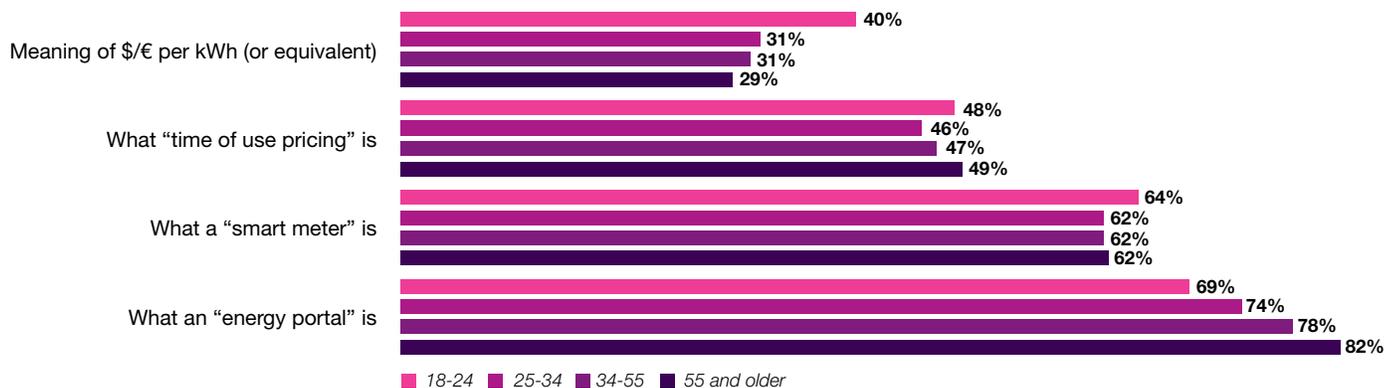
**Figure 4: More questions are generated about energy data privacy as consumers become more knowledgeable.**

We also found that knowledge directly gained through experience with smart meters installed at homes was driving more comfort and engagement, especially for privacy. Among those already experienced with smart meters on their homes, the percentage concerned that the information poses any privacy threat is one-third less than those who have never had one.

**Missing the consumer education target**

The fact that knowledge leads to positive consumer actions is the “good news” side of the results. The bad news is that such knowledge, even for basic concepts, is severely lacking. For example, when asked if they understand the standard pricing unit for consumption (for example, cents or euro per kWh), over 30 percent of consumers reported that they had never heard of the unit or do not know what it means. This has major implications for the implementation of programs like time-of-use pricing (a term which half of those surveyed did not recognize at all). Over 60 percent didn’t know what “smart meter” and “smart grid” mean, and “customer energy portal” had no meaning to more than three in four respondents (see Figure 5).

**Percent of respondents who do not know the answer to the specified question or statement**



Source: IBM 2011 Global Utility Consumer Survey.

**Figure 5: Major knowledge gaps exist across all age groups, which could hinder industry progress toward participatory networks.**

In some markets, this void in understanding has been aggressively tackled by forces both pro- and anti-change with messages delivered through a wide variety of channels. Many of these messages addressed valid areas of concern and presented important parts of the debate. However, some of the messages focused on negative outcomes that are highly unlikely with adequate protections in place. Others focused on more positive outcomes for which the timing and availability are not yet known with certainty. In combination, consumers are often getting conflicting messages that do not present a clear picture of the future.

### Driving behavior patterns

Influences that drive a consumer's expectations take two forms: messages that most strongly influence motivations for change and sources that provide the strongest channels of delivery of knowledge and opinion. Each is important separately, but because of strong differences in their impacts on different age groups, their interaction is critical as well.

Saving money remains the strongest behavioral influence overall. However, the importance of other influences is on the rise. In about half of the countries surveyed, motivations to change energy consumption behavior to help keep the national economy strong and improve energy security outweighed motivations based on improving impact on the environment. This was particularly true in the United Kingdom, the United States and Poland. In the other half, environmental concerns did outweigh economic ones, with Denmark, Canada and Chile leaning most strongly in that direction.

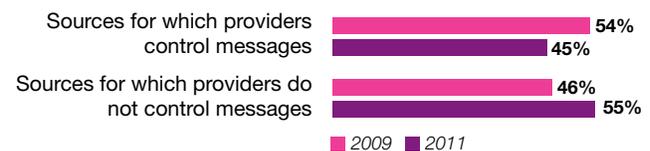
Regardless of which influence played a stronger role in motivating change, the age of the respondent is a strong driver of what is important. Those 45 or older were as much as 40 percent more driven by concerns related to cost control, energy security and the impact of energy prices on the national economy. Conversely, among younger consumers – particularly the under-25 group – the influence of environmental concerns was much higher than for the 45-and-older group.

### Beyond this month's bill

If consumers are to be better informed and influences more targeted, what are the best ways to deliver the messages? The most effective channels of influence differ across age groups as well. Not surprisingly, the youngest age group we evaluated – age 18 to 24 – had some of the most distinctive factors. In this age group, people gravitate to energy information they can find online (particularly social media-based) to a much greater degree than older consumers. Online social networking was twice as often reported to be a primary source of information for respondents under 25 than for those 25 to 34, and six times more than for those 35 and older. Similarly, online video content was cited as a primary source of information five times more than for those 18 to 24 than for those 25 to 34, and nine times more than for those 35 and older.

The most significant finding about messages and influences, however, comes from looking at the aggregate contribution of sources that have significant influence on consumers' knowledge and perceptions. In this year's survey, the percentage reporting that they use an information source that is not under the control of the consumer's provider exceeds the percentage that uses a source directly under the control of the provider (see Figure 6). This finding points to a major shift in

#### Information source(s) to which consumers are most likely to go to get information about energy cost, environmental impact, alternative suppliers, or new programs and services (grouped)



Data shown for 12 countries represented in both 2009 and 2011 IBM Global Utility Consumer Surveys.  
Sources: IBM 2009 and 2011 Global Utility Consumer Surveys.

Figure 6: In aggregate, providers' influence on messaging for their own customers is now outweighed by other sources.

messaging power. Consumers are now relying less on information that comes from their own energy provider and more on other influences. The effect increases when looking at the emerging economies and is stronger for younger consumers than for older ones. These findings seem in line with the diffusion of information and opinion via the Internet, mobile applications and social media – a phenomenon that is changing the way companies in almost every industry engage their customers.

### **Making choices: Too much of a good thing?**

As part of our ongoing research into the future of residential energy service, experts in consumer marketing and behavioral economics from IBM and academia participated in a workshop to examine the intersection of influences, messaging campaigns and decision making. One of the more important ideas discussed in the workshop was the role of “decision frames” – psychological structures that people create to organize and simplify the world around them.<sup>6</sup>

Often, industry advertising campaigns focus strongly on a particular long-term impact that smart meters and smart grid technology may have on the individual – such as cost, environmental impact, reliability or reduced dependence on non-domestic energy sources. These core themes are often deployed across a broad media spectrum and centered on a simple, easy-to-understand message addressed to the broadest audience possible within the entire consumer base.

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*One major shift: Consumers are now relying less on information from their own energy provider and more on other influences.*

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However, the role of these impacts as decision frames for energy in consumers’ minds makes this very difficult to achieve. A simple message can miss the mark with a very high percentage of consumers either because it simply does not resonate with them, or worse, it is in direct conflict with the decision frames in which they view energy-related decisions.<sup>7</sup>

Where cost is a primary decision frame, it is important to consider the impact of price levers (such as time-of-use pricing) on changes in consumer behavior patterns. These have been very successful in other consumer contexts, such as mobile phone minutes and demand pricing for airline seats. However, applied without a careful strategy, price levers pose a risk of looking like they are penalty controlled (“I am paying more for this”) rather than incentive driven (“I am choosing to do this”).

As factors other than cost continue to rise in importance as decision frames, understanding and addressing additional factors that motivate consumers will be critical to successfully change habits. This does not, however, mean that options should be provided to address every priority suggested by all of the various consumer segments. Aside from the expense and contradictions inherent in trying to do so, the resulting complexity could likely demoralize consumers.

Behavioral economics suggests (and experience has demonstrated) that presentation of a large number of choices can result in decision-processing problems. When this happens, people are more likely to lean on the recommendations and choices of preferred sources, rather than sort through options on their own.<sup>8</sup> By presenting a more limited but well-balanced set of options, energy providers can avoid complexity that can confuse people and stifle their desire to make independent choices.

Tapping into the inherently social nature of people is another way to encourage the adoption of new ideas – and one that will become increasingly important as today’s teenagers and young adults move into the customer base. “Social proof,” or observation of the habits of others, is a critical determinant in how people react to unfamiliar situations.<sup>9</sup> This is the key idea behind new concepts such as interactive Web portals that allow consumers to compare their energy usage to that of their neighbors. Being able to make comparisons also taps into the instinct many people have for competition.

Even if perfect alignment of messages, choices and priorities is in place, however, we also know from our studies in other industries that there usually is a significant subset of the population who will not pay attention to the choices offered and passively continue the behavior patterns to which they are accustomed. In fact, our utility survey identified this class as over 30 percent of the total number of energy consumers, a number recognized as typical by executives in other retail industries.<sup>10</sup> For that reason, we have intentionally avoided segmenting customers into a collectively exhaustive set of segments that will make specific choices, or buy specific products or services based on their preferences. To do so would ignore the reality that about one-third are expected to sit on the sidelines regardless of what develops.

## Conclusion

In general, energy providers and utilities have done a good job of painting a vision – getting consumers, regulators and the media to imagine what possibilities new energy technologies lend to the future. They have also garnered a sense of what new products and services might create the greatest value and satisfaction. However, this successful communication of the broad societal case for smart grid and smart meter technologies may have created an environment in which the *long-term possible benefits* have come to represent the *immediate expectation of benefits*. This has created an opening for influential parties – who now have a stronger voice than ever due to consumers’ increasing reliance on sources outside their providers’ control – to paint this gradual build-up of capabilities and benefits as a failure to provide them at all.

Without a good core knowledge level on which they can rely, consumers can only work with what they learn through their most trusted channels, even if inaccurate. This is why it is critical to recognize that almost half of consumers are deficient in even basic knowledge. The good news that comes out of this survey is if that knowledge core can be improved, higher levels of approval and willingness to engage are likely to follow, and system and societal goals can be easier to meet.

Regardless of their knowledge bases, consumers have perceptions that result from existing influences and knowledge levels must be taken seriously, as they are the most important factors driving expectations and willingness to engage. It will be critical for energy providers, governments and other parties with a stake in the future of the smart grid to discuss perceptions in an honest and complete manner, regardless of source or context. For example, perceptions on privacy are critical; tell consumers how each of them is being addressed in meter and data deployment and oversight plans. Even unrealistic perceptions should be addressed with an honest explanation of how any negative outcomes will be avoided or mitigated. Examples across other consumer impacts – such as meter accuracy, total costs and health effects – need to get the same scrutiny and care in communication.

Companies involved with the planning for, deployment of and business development related to smart grid and smart meter technologies should consider the following actions to address critical gaps in the influence-knowledge-perception-expectation chain:

- Recognize that certain motivators and channels of delivery hit specific demographic categories most effectively; align messages and channels to optimize impact.
- Leverage key lessons from behavioral science and economics to better align consumer response with knowledge resources and provider messages.
- In the short term, forego the push to educate consumers on the details of smart meters and smart grids. Instead, renew focus on the most basic information for the majority, including assuring that data privacy protections are in place. Provide self-learning resources for those who are ready for more complex ideas.
- Consider a more social strategy for communicating knowledge and success stories to reach groups where traditional communication via bill inserts and advertising fails to connect with important groups of customers. This is particularly true for consumers with strong family dynamics and consumers younger than 25.
- To help address the knowledge gaps and areas of concern for smart meters, learn from and employ marketing techniques being used in other industries facing technological and consumer engagement upheaval.

Navigating the *consumer energy experience chain* will be one of the core competencies in coming years that will help determine how smoothly smart meter and smart grid deployment will go and how engaged consumers will be. The industry needs to understand and manage the *expectations* of consumers by driving *perceptions* that are realistic in impact and timing of availability. This can only be done successfully if providers and retailers provide much-needed *knowledge* at the right level of sophistication – from very basic to fairly advanced – and do so through the most effective *influencers* for specific groups of consumers. If analyzed within the context of local demographics and dominant decision frames, this chain can build much-needed engagement and help ensure the right messages are reaching the right people through their trusted channels.

## About the authors

Michael Valocchi, Global Energy and Utilities Industry Leader for IBM Global Business Services, is responsible for the development and execution of the strategy to deliver consulting services and directing industry thought leadership. Michael has over 25 years of experience leading projects related to smart grid, mergers and acquisitions, technology and regulatory strategies. He has also written or co-written numerous papers and articles on the utility industry. In addition, Michael has served on the editorial board of IBM's annual thought leadership compendium *Generating Insights* for the past seven editions. He can be contacted at [mvalocchi@us.ibm.com](mailto:mvalocchi@us.ibm.com).

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- 4 An important new component of the 2011 survey is the inclusion of almost 1,800 sets of responses to questions that address, specifically and in detail, how consumers view energy data privacy issues in four of the countries in which this has become a particularly contested issue in recent months. This consideration is crucial because it plays a major role in how consumers view the introduction of these new technologies, especially smart meters.
- 5 Percentages in this paragraph and in Figure 2 represent the total number of respondents listing the item as one of their top three concerns. Thus, the percentages overall will add to much greater than 100.

- 6 Russo, Edward and Paul Schoemaker. *Decision Traps: The Ten Barriers to Decision-Making and How to Overcome Them*. New York: Simon & Schuster. 1990.
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- 10 IBM Institute for Business Value analysis based on numerous interviews and meetings with clients in various industries. 2010-2011.





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January 2012  
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