COMMENTS OF TENDRIL NETWORKS, INC.

Department of Energy
Request for Information: Addressing Policy and Logistical Challenges to Smart Grid Implementation

November 1, 2010

Introduction

Tendril is pleased to provide these comments to the Department of Energy (DOE) in response to the Request for Information "Addressing Policy and Logistical Challenges to Smart Grid Implementation." Tendril offers a software and hardware solution that enables residential home energy management and demand response. Therefore, our comments will primarily address issues that affect metering technologies, consumer-facing programs and the integration of new technologies with grid infrastructure.

Tendril believes, and the DOE has made similar observations in this RFI and other documents, that the smart grid is a platform for innovation that can deliver a wide range of operational, efficiency and clean energy benefits. Therefore, we support efforts to address the policy and logistical challenges to smart grid implementation.

As the DOE has also observed, "Technology, business, consumer and regulatory issues interact in complicated ways." We balance this observation against the encouragement for "stakeholders to be concise" in their responses. The set of questions comprising this RFI do not easily reduce to simple, concise responses. Thus, in the absence of specific *procedural* or *practical* application of the responses to these questions posed, we will focus our remarks on the key elements of policy that we believe the Administration and the Smart Grid Subcommittee can address through federal policy. (We are also members of the Smart Grid and Demand Response Coalitions, which is providing more detailed responses to the specific questions put forward in the RFI.)

Recommendation

To the extent that, "DOE is undertaking this Request for Information (RFI) on behalf of the Administration and in consultation with key stakeholders from state regulatory bodies," and that, "Comments on the RFI will help inform the Administration's analysis of policy challenges and possible solutions being developed by the Smart Grid Subcommittee of the National Science and Technology Council's Committee on Technology," we offer the following recommendation:

The Administration should publish "preliminary conclusions" and "policy recommendations" with regard to smart grid deployment

We believe that concrete conclusions and proposals will produce concrete responses. Respectfully, we observe that this RFI follows a series of investigations, reports and RFI's conducted by federal government commissions and agencies in the past year.[1] Each of these processes has produced an enormous body of evidence, testimony and commentary. There now exists more than sufficient evidence on the public record for the Administration (presumably through the Smart Grid Subcommittee of the National Science and Technology Council's Committee on Technology) to advance a set of "preliminary conclusions" and attendant "policy recommendations" that stakeholders can review, discuss and inform.

At this point, deployments are actively moving forward in states across the country. Regulators are considering policy issues related to cost allocation, enabling access to customer usage data and developing frameworks to protect consumer privacy. At least one venue exists for federal-state partnership through the FERC-NARUC Collaborative on Smart Response. The Administration faces the risk that policy objectives, so long as they remain undeclared, will be increasingly irrelevant in the face of ongoing deployments and state-level regulatory decisions.

Recommended Components of Smart Grid Policy

We believe that federal policy on smart grid should focus on several key areas. We recognize and highlight the primary role of state regulatory bodies in governing markets for electricity around the nation. These bodies, in general, are the most informed and best positioned to consider the appropriate technology details and cost allocation questions relevant to the deployment of smart grid technologies. At the same time, federal policy can mitigate the risk that these state-level decisions create unnecessarily fragmented markets or that they are not informed by national priorities on energy policy. With that in mind, we offer the following components that we believe should be included in federal policy related to smart grid:

Smart grid is a platform for multiple national priorities
It has been widely observed that the smart grid is a combination of technologies, policies and applications that can achieve multiple objectives that are national priorities. These priorities include increasing energy efficiency, advancing clean energy technologies, integrating electric vehicle technologies and enabling capabilities for responsive demand to better manage our electric grid. Additionally, developing a marketplace for these technologies domestically will enhance the competitive position of the United States in the global economy. A national smart grid policy should focus on achieving these national priorities and provide forceful mechanisms to encourage state regulators to support these national objectives.

Smart grid must be a "consumer smart grid" [2]

Recent deployment experience confirms that consumers will resist or reject smart grid deployments that do not provide direct consumer benefits. Coupled with poor customer engagement strategies, the lag between the realization of utility-side benefits and corresponding consumer-side benefits has left many consumers (and their advocates) reluctant to support smart grid deployment. A national smart grid policy should ensure that smart grid deployments enable the "consumer smart grid." This includes establishing a foundation for consumers to have access to their energy usage information; development of an adequate framework for protecting privacy; and accelerating the development of a robust market for energy management services on the customer side of the meter. Additionally, national smart grid policy should reinforce that devices or in-home technology remain under consumer control. To the extent that consumers may grant utility or third-party access to devices that reside within the consumer domain, national policy should emphasize the importance of opt-in program frameworks for in-home technologies based on informed consumer consent. As a programmatic priority, DOE can accelerate the development and deployment of in-home technology though both research and project deployment funding.

Federal policy should support competitive markets for energy management and "beyond-the-meter" services

The consumer marketplace for smart grid technologies should be supported by federal policies that encourage an open, competitive marketplace for energy efficiency and energy management services. We believe this is an appropriate focus area for federal policy, especially in the context of a largely regulated monopoly market structure. State regulatory bodies are currently grappling with questions addressing the proper demarcation points for regulated utility service, consumer privacy and the incorporation of consumer devices into utility demand response and energy efficiency programs. Federal policy should support the development of a marketplace that allows competitive forces to drive innovation in technology and services "beyond the meter." Toward this end, federal policy should seek to ensure that demand response and energy efficiency programs are implemented in a manner that provides accessibility to market participants in a fair and competitive manner.

The consumer smart grid market requires a foundation of open information

Currently, most state-approved and federally supported smart meter and smart grid deployments do not adequately ensure that consumers will benefit from access to their energy usage information. This includes both their historical interval usage data and real-time information about current consumption levels. Both kinds of information have repeatedly been demonstrated to be a necessary component of programs to drive energy efficiency in a highly cost-effective manner.[3] For both applications, there are nationally recognized standards or best practices that ensure reliable and secure transfers of data. Federal policy should ensure that all consumers are afforded adequate access to the timely and useful data generated by smart grid and advanced metering technology. Such

assurances advance national goals on energy efficiency and support an open marketplace for energy management services described above.

Wholesale markets should be accessible to consumers and demand response aggregators
Federal policy should support the ability of the consumer marketplace to benefit from open and competitive wholesale market structures. In particular, demand response programs and third-party aggregation mechanisms should be encouraged by federal policy to establish open access and fair competition. Currently, for example, in many jurisdictions, access to wholesale market transactions may be limited to transaction through a "host" utility. Or, wholesale markets may be obfuscated by an integrated monopoly market structure. One potential application of smart grid technology is to mitigate the need for such hosted transactions and to help consumers identify the correlation of their consumption patterns to system conditions and costs. Federal policy should support the market evolution toward direct access to wholesale markets and the ability of consumers to engage in a fair and competitive market of utility and third-party aggregation.

State regulatory authority with regard to cost allocation and technology deployment should be recognized and supported
State regulatory bodies have long-standing authority and expertise with regard to cost allocation in the electricity sector. Additionally, these bodies are best positioned to make geography- and state-specific determinations about the appropriate technologies and applications based on existing infrastructure. States have also established advocacy and oversight mechanisms to ensure basic consumer protection frameworks. Federal policy should not seek to diminish this authority. Rather, we encourage federal policy to continue to support these state regulatory bodies as the primary venue for assessing the costs and benefits of specific deployment proposals. Federal objectives and national priorities are complementary to this basic regulatory framework, but state regulators must be provided with appropriate signals that allow them to incorporate federal policy into their decisions. A federal policy on smart grid, including components enumerated in these comments, would be one such signal.

General Remarks

As noted above, we believe that there is now a well-established and sufficiently robust record upon which the Administration can and should develop federal smart grid policy. Specific conclusions and recommendations, in our opinion, are needed to advance these goals.

We do not believe that it should be a high priority to "redefine" the term "smart grid." The components of smart grid technology (communications, standards, interoperability, etc.) will vary from region to region and deployment to deployment. Federal policy should recognize and encourage this robust diversity and avoid the temptation to identify or select a single model for deployment.

Consumer markets have been demonstrated to be powerful engines for change and innovation provided that consumers have access to open, fair and competitive choices. Consumers will respond to these choices, as they have in other sectors of the economy. The willingness and ability of consumers to respond has been repeatedly demonstrated in trials and early deployments. Federal policy makers should build on these observations and reframe their investigations away from questions of "if" consumers will respond.

Toward this end, federal research priorities should focus on developing the necessary technology foundation to support interoperable devices that have the fundamental capability to support national priorities. Priority areas include further development of in-home technologies, appropriate sub-metering capability, and integration with clean energy, smart appliances and electric vehicle technology. Federal policy should focus on developing the smart grid into a platform for innovation, which will achieve economic, environmental and policy objectives.

Thank you for the opportunity to provide these comments. We look forward to the continued ability to inform and advance federal policy-making in this area.

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[1] During 2009-2010, federal agencies and commissions including FERC, FCC, DOE, NIST, EPA and OSTP have issued multiple RFI's and reports. We do not attempt to provide a comprehensive list, but a partial list includes publication of FCC's *National Broadband Report* (following extensive comment periods and hearings), two RFI's from DOE (and accompanying workshops), FERC policy statements, a weblog hosted by OSTP on behalf of NIST and other initiatives.

[2] We have attached to these comments an industry paper that expands on some of the principles of the "consumer smart grid."

[3] *See*, for example, "Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities," American Council for an Energy-Efficient Economy, Report Number E105 (June 2010). This report observed that feedback programs have the potential to reduce energy consumption by up to 6%. In particular, they note that "real-time plus" programs "appear to generate the largest savings (as high as 12%)." (p.75) Further, the authors performed a series of cost-benefit analyses which show that real-time plus are quite cost-effective, with a Total Resource Cost Test ratio of 2.54 and the highest per-household savings. (p.78)

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APPENDIX

A Vision for the "Consumer Smart Grid"

Also available at:
http://www.tendrilinc.com/wp-content/uploads/2010/10/Tendril-Vision-Whitepaper.pdf

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A VISION FOR THE "CONSUMER SMART GRID"

Around the nation and the world, the electric grid is being modernized with advanced meters and Smart Grid technologies. Yet, the success of the Smart Grid will ultimately be measured by the level of consumer engagement it creates that supports efficiency and reliability. Tendril believes that public policy must foster the creation of a competitive marketplace for the "Consumer Smart Grid."

Done properly, the Smart Grid can help our nation (1) fight climate change through efficient and clean energy production, (2) create jobs by shifting investment capital into the new energy economy, and (3) foster innovation by creating an economic engine that will keep America leading the global economy.

We believe that creating a marketplace for the Consumer Smart Grid to flourish requires forward-thinking public policy and regulatory strategy. In this paper, we offer a perspective to help inform those policy discussions.

THE CONSUMER SMART GRID IS A PLATFORM FOR INNOVATION

Tendril strongly believes that the Smart Grid is a platform for innovation, efficiency, job creation and global competitiveness. We are active in policy discussions ranging from the implications of federal legislation to state regulatory decisions to consumer protection issues. We are participants in these conversations because the success of the Smart Grid will be measured by the degree to which consumers are engaged and utilize new technologies leading to lower costs, higher reliability and cleaner energy.

Consumers will reject a Smart Grid that does not provide tangible benefits or respect consumers' autonomy. We have seen resistance and skepticism from early smart meter deployments that have not included these direct customer benefits. We propose that public policy should foster the creation of a consumer marketplace consisting of:

Access to information and communication networks
Choice of products, partners and service offerings
Control over the home environment and private information, and
Value from new services, products and quality of life

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The “Smart Grid” has been heralded as a way to modernize and transform the energy industry in the United States and worldwide. The Smart Grid vision includes a self-healing, intelligent network that accelerates the integration of renewable energy, electric vehicles, automated energy management and a new class of smart appliances. This combination will open new doors for customer decisions to control costs and energy usage. New rate offerings will reflect the real-time economic and environmental costs of energy, enabled by innovative new technologies that automate customer decisions and provide services we are only beginning to understand.

We call this comprehensive vision the “Consumer Smart Grid.” Consumers will choose intelligent appliances from a competitive marketplace. Appliances and devices will be designed to integrate into their home according to open standards, just like the standards that define the wall outlet or a computer USB connection. Consumers will be able to select partners that can help optimize their energy budget and environmental footprint to match their lifestyle choices. They will also have opportunities to choose stable and predictable rate plans that protect low-income and fixed-income consumers. Yet this “Smart Grid” will only reach its full potential if a corresponding “Consumer Smart Grid” is created at the same time.

We believe that creating a vibrant Consumer Smart Grid will create millions of high-quality jobs, fight climate change, increase our energy security and position the US cleantech industry to be fiercely competitive in the global market.

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THE CONSUMER SMART GRID REQUIRES CONSUMERS TO HAVE ACCESS, CHOICE, CONTROL AND VALUE

For the Consumer Smart Grid to succeed, public policy must embody and enable the market conditions that create success. Part of the market solution is physical, requiring new technology and related standards deployed in the field. But a larger part of the market solution is policy. Because much of the technology is new, many of the most critical policy questions are only now being addressed for the first time by state public utility commissions and federal regulators. We believe the fundamental requirements of a true consumer market can be organized into four broad categories – access, choice, control and value.

Access

A consumer marketplace requires actionable and timely information

Consumer markets thrive with open access and healthy competition. The consumer market is a powerful force for change. But like all markets, the Consumer Smart Grid will only be truly effective when it has accurate and actionable information. We believe that open, standardized access to information and transaction flow is a fundamental need of an open marketplace.

As an immediate priority, consumers must be granted access to their energy usage information on both a time-interval and real-time basis. Further, consumers, innovators and policy makers all require access to information and transactions that have not traditionally been available to the market. As technology allows us to create far more granular and real-time information, it is useful to recognize that not all information is created or used in the same way. Information that consumers need in order to implement effective energy-saving or carbon-saving strategies is different from the information the utility needs to generate an accurate billing statement. Transactions a consumer needs to automate their energy use while maintaining comfort may be different from transactions the utility needs to moderate peak load or variable renewable generation.

We believe it is useful to distinguish among different *kinds* of information in the Smart Grid, in large part because each might require different communications systems. The AMI networks currently being deployed by utilities nationwide provide a useful infrastructure, but many other two-way communication systems are available or in planning that can also be used by the consumer and system operators.

We view at least four distinct classes of information, summarized as:

Actionable Information. Real-time information needed by consumers to implement behavioral change or control strategies in the home.

Analytical Information. Historical information needed to analyze a time series of usage or transactional data and create useful feedback tools.

Transactional Information. Real-time or forward-scheduling information that enables market transactions or control signals to be sent, received and verified.

Billable Information. Historical information that is required in order to bill for services and accurately reflect services received by the consumer.

Multiple communications networks must be available to the consumer

For our nation to achieve the full benefit of the Consumer Smart Grid, multiple communication networks must be accessible to the market. Consumers must have access to a variety of networks that bring information into and out of their homes. These networks must be reliable, secure and available with a point of presence at the residence. At the same time, grid operators may require hardened mission-critical networks. Today, a variety of networks (wired and wireless, licensed and unlicensed, private and commercial, fixed and mobile, broadband and narrowband) are used throughout consumer markets and energy systems. Moving forward, we must embrace this great variety and wealth of network capabilities. We must seek ways to find the best fit between applications and available networks. In addition, by anticipating and enabling multiple communications networks, we will allow consumers to be better positioned to take advantage of data processing, storage and analytical services available from innovative companies in the broader marketplace.

The consumer marketplace will incorporate the value of demand-side management, carbon reduction, Energy Efficiency and product solutions if the information is available. What is important is ensuring that there are standard methods by which information can flow and transactions can be enabled. What works well in one geographic area or regulatory regime may not work well in another. Therefore, we believe that public policy should remain flexible to accommodate multiple communications networks and avoid the temptation to force a single solution.

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Choice

An open marketplace can meet the need of wide-ranging consumer preferences

Consumers must be able to choose from a competitive marketplace of demand-side service partners who can give them control and security in how they manage and optimize their energy use. The consumer market requires choice of products, choice of partners and competitive prices. We believe that regulatory decisions and standards development must promote these fundamental qualities of a successful consumer marketplace.

On the consumer side, we support a market where retailers offer energy management equipment with simple installation that can be controlled directly by the consumer or by an energy management partner of their choosing. And while this model might create a strong value proposition within the home, the value increases dramatically when combined with pricing information and rate structures that allow interactions with the utility. The value is stronger still if these systems can take advantage of generation information that provides insight into the carbon intensity of the grid in as close to real-time as practical. Similar information about grid reliability or peak demand creates further value. All of these benefits will be realized when consumer systems are designed with the grid in mind, and vice-versa.

It is widely accepted that consumer preferences and tolerance for risk vary across age, income, geography and multiple other dimensions. Tendril research confirms that consumers have a need to be engaged in ways that respect their authority and preferences. We firmly believe that in order to achieve ubiquity of Home Energy Management solutions, consumers must have full decision-making control over when and how they opt-in to utility programs and how they control the devices, appliances and systems within their home.

We view open standards as a key element of enabling consumer choice. Within the home, consumers should feel confident that products they purchase will be able to connect and communicate with other devices and Home Energy Management systems. In this regard, Tendril is a very active participant in the standards development process, including key leadership positions within the NIST standards process.

Control

Consumers must feel confident that they have control over the use of their private information

Understanding behavior requires understanding consumer needs. Tendril research (in partnership with IDEO, a leading industrial design firm) revealed a set of consumer principles that we believe have important policy implications. We identified fundamental needs around consumers' desire for awareness (but not judgment), information prompts (but not excessive

"noise"), engagement (but respect for their authority) and rewards that allow them to continue to improve their lives. Included within these fundamental needs is retaining control over their personal information, making privacy a critical component of the Consumer Smart Grid.

At a fundamental level, our research confirmed what we know intuitively to be true – consumers strongly desire control over their home environment and have reasonable expectations of privacy. We believe these tenets of consumer needs imply a corresponding set of policy implications, which we summarize as:

Inform: Policy should be oriented to provide open, available and actionable information that allows the consumer insight into their real-time and historical energy usage, grid conditions and market prices.

Prompt: Policy should create, but not mandate, time-differentiated rates, peak load incentives and grid management information that accurately reflect underlying energy and system costs. This information will spur consumer action. Other information to which we have seen strong consumer response is renewable energy content and competition between communities or against benchmarks.

Engage: Policy should ensure that consumers retain control over the devices in their homes. Any consent to allow utilities or energy service partners to access and control devices must originate from an informed consumer. Further, consumers must have security over the integrity and use of their private information.

Reward: While protecting the base needs of low-demand customers, policy should ensure that consumers that are responsive to time-based rates or other incentives are able to realize real economic benefits. These benefits can include bill savings, reductions in overall system costs, carbon emission reductions or other elements that contribute to their overall engagement. Further, we see opportunities for incentive programs to provide other benefits such as "rewards programs."

Following on our earlier observations, in order to bring forth a truly robust Consumer Smart Grid, public policy should embrace the consumer's need for autonomy, respect the consumer's need for privacy, incorporate underlying energy and system costs, and encourage innovation and competition in energy services.

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Value

Greater insight will allow consumers to manage costs

First and foremost, the increased insight available from Smart Grid technologies allows consumers and utilities alike the ability to manage costs and eliminate wasteful usage patterns. Additionally, consumers will have the ability to use increasingly sophisticated analytical tools and partners to recommend other strategies and energy-savings products. The ability to manage both energy costs and energy consumption is a fundamental value of the Consumer Smart Grid.

In many state regulatory regimes, new mechanisms can facilitate these energy and cost savings. For example, decoupling many portions of fixed-cost distribution investments from retail rates can reduce the utilities' incentive to increase energy sales. Properly implemented, this encourages utility Energy Efficiency programs that better reflect the true cost of service to the consumers.

A consumer marketplace will recognize that not all electrons are created equal

While we have grown accustomed to paying a flat rate for each kilowatt-hour of power we use, this price structure masks the fundamental truth that there are tremendous variances in what it costs to produce and deliver energy. These variances occur based on time, location and type of energy. Energy during peak demand periods can cost 100x or more what it costs during off-peak periods. These peak moments can occur less than 1% of the time, but may account for 10-20% of the energy costs in flat rates.[i] There is also tremendous variance in the environmental impacts of energy production. If we do not design the Smart Grid to take advantage of this information in real time, we will continue to underutilize the applications available from Smart Grid technologies.

The Consumer Smart Grid, with accurate real-time information, can help consumers and communities shift usage to periods of cleaner energy while also creating more control and comfort within the home.

Consumer behavior is a critical measure of Energy Efficiency

We have also grown accustomed to considering "Energy Efficiency" as simply a result of hardware choices. That is, Energy Efficiency is commonly considered the measure of how effectively a device or appliance converts energy fuels as it operates. But, this is only half of the picture. It assumes that all consumers act according to similar behavioral profiles. To have an accurate picture of efficiency, we must also consider the basic behavior aspects of how, when, and for how long energy is used. It has been repeatedly shown that simple real-time

information feedback about consumption creates behavioral savings. A recent review of pilot programs concluded that customers who actively used an energy monitor reduced their electricity consumption by about 7%, with some reaching as high as 18% reductions. In fact, the results showed that in-home displays had a greater conservation effort than time-of-use pricing programs.[ii] A similar review of programs providing customer feedback concluded that real-time information was a critical foundation of driving energy savings. When combined with energy saving recommendations, real-time information led to savings of nearly 15% with very favorable cost-benefit test results.[iii]

These results suggest that behavioral and time-of-use changes must be incorporated into Energy Efficiency programs. Indeed, many states are now developing rules and protocols addressing how these efficiency gains can be assessed. Properly accounting for these benefits may also require new cost-benefit methodologies that properly account for behavioral changes from Consumer Smart Grid applications.

GUIDING PRINCIPLES FOR CONSUMER SMART GRID POLICIES

The marketplace for the Consumer Smart Grid is being defined today through the policy decisions of federal legislators, state utility commissions, standards organizations and a myriad of stakeholders around the country. Implemented wisely, Consumer Smart Grid policies will allow the nation to once again lead in the global competition that is well underway for clean and innovative energy technology.

How should consumers access consumption information made available by smart meters? When should electric vehicles be charged to optimize grid operation? How should consumers be given information about when clean energy is being produced? How should consumer privacy be protected?

We believe that effective regulation is built on a foundation of strong federal-state collaborations. While it is tempting to look only to state regulators because of the historical role of state public utility commissions in establishing rates, we believe that new technology innovation and clean energy goals demand that the federal government is an active participant. The federal government is best positioned to establish a comprehensive vision for the nation and then allow the states to design markets that will be effective in each region.

We believe this is happening today. Congress has passed multiple pieces of legislation that establish policy objectives and goals for Smart Grid deployment. Multiple federal agencies (notably DOE, FERC, NIST, FCC and EPA) have active programs addressing grants, standards, communications and certification. More recently, the White House has established efforts to

examine Smart Grid opportunities, including a Subcommittee focused on Smart Grid. State legislatures have similarly enacted various mandates for Smart Grid activity. Regulatory commissions have examined Smart Grid and advanced meter deployment and are now turning their attention more broadly to implementing time-based rates and consumer engagement strategies. And increasingly, proposals to deploy advanced meters are being coupled with programs to ensure that consumers realize immediate and direct benefits.

We see great value in this portfolio of policy and regulatory approaches. The challenge ahead is coordinating these efforts so that they remain complementary to one another.

Tendril remains an advocate for best-in-class policies and regulatory strategies. We believe that unleashing innovation in the Consumer Smart Grid will deliver massive benefits that will allow our nation to:

- Take aggressive action on climate change,
- Be fiercely competitive in the global marketplace,
- Create new industries with competitive companies and millions of jobs,
- Expand prosperity for entrepreneurs and consumers alike.

We look forward to continuing to be part of the discussions that will shape this industry.

THE CONSUMER SMART GRID IS THE FUTURE…AND IT IS HERE TODAY

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FOR MORE INFORMATION contact *policy@tendrilinc.com*

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[i] Government Accountability Office, *Electricity Markets: Consumers Could Benefit from Demand Programs, but Challenges Remain*, August 2004, (GAO-04-844)

[ii] Brattle Group. "The Impact of Informational Feedback on Energy Consumption." Ahmad Faruqui, Sanem Sergici and Ahmed Sharif

[iii] American Council for an Energy-Efficient Economy, "Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities," Karen Ehrhardt-Martinez, Kat Donnelly, and John "Skip" Laitner, June 2010 (Report Number E105)