701 Pennsylvania Avenue, N.W.
Washington, D.C. 20004-2696
Telephone 202-508-5615
Fax 202-508-5673
www.eei.org

EEI EDISON ELECTRIC INSTITUTE

November 1, 2010

U.S. Department of Energy
Office of Electric Delivery and
Energy Reliability
ATTN: Smart Grid RFI:
Addressing Policy and Logistical Challenges
1000 Independence Avenue, SW
Room 8H033
Washington, DC 20585

RE: SMART GRID RFI: ADDRESSING POLICY AND LOGISTICAL CHALLENGES TO SMART GRID IMPLEMENTATION

The Edison Electric Institute ("EEI"), on behalf of its member companies, hereby submits the following comments in response to the request by the Department of Energy ("DOE" or "Department") for information on a wide range of issues dealing with Smart Grid technology, applications, consumer interaction, policy initiatives and economic impacts, including the definition of Smart Grid; interactions with and implications for residential, commercial and industrial customers; Smart Grid costs and benefits; collaboration between utilities, device manufacturers and energy management firms; long-term Smart Grid issues; reliability and cyber security; and managing transitions to the Smart Grid.[1]

EEI is an association of the United States investor-owned electric utilities and industry associates worldwide. Its U.S. members serve almost 95 percent of all customers served by the shareholder-owned segment of the U.S. industry, about 70 percent of all electricity customers, and generate about 70 percent of the electricity delivered in the U.S. EEI frequently represents its U.S. members before federal agencies, courts, and Congress in matters of common concern. EEI has filed comments before the DOE in various proceedings affecting interests of its members, including prior DOE Requests for Information involving Smart Grid-related issues.

EEI's members are evaluating, planning, investing in, and deploying various Smart Grid technologies across the United States to improve service to their customers, and may be directly and indirectly affected by the instant proceeding. The primary interest of EEI's members in this proceeding is the advancement of policies that promote Smart Grid use and development while also ensuring that electric customers continue to receive safe, reliable and cost-effective service.

EXECUTIVE SUMMARY

EEI agrees with the Department of Energy that the Smart Grid has the potential to improve service by reducing cost and increasing reliability while making greater use of a variety of new renewable energy sources. Consequently EEI supports the efforts of the Department and the Smart Grid Subcommittee of the National Science and Technology Council's Committee on Technology to identify the policy and logistical challenges that confront Smart Grid implementation and to obtain an up-to-date understanding of the context in which Smart Grid

[1] *See* Smart Grid RFI: Addressing Policy and Logistical Challenges to Smart Grid Implementation, 75 Fed. Reg, 57,006, Sept. 17, 2010 ("Notice").

technologies, business models and policies operate. It is critical that the United States remain a global leader not only in the development of Smart Grid technologies, but also in the implementation and utilization of Smart Grid technologies and applications. Hence, the electric industry agrees that it is important for stakeholders to continue to research, develop, and deploy Smart Grid systems in a collaborative manner. It is only in this way that we can all work together to "assure [S]mart [G]rid deployments benefit consumers, the economy and the environment."[2]

To assist the Administration on how to best overcome policy and logistical challenges that confront Smart Grid research, development, and implementation, the Department appropriately initiates its inquiry by seeking input on the best way to define the term "Smart Grid."[3] While the broad definition of Smart Grid pursuant to the Energy Independence and Security Act of 2007 (“EISA”) is useful and appropriate given that Smart Grid development is in its nascent stages, there is great confusion surrounding this issue. For example, it is misleading to speak of developing a "Smart Grid" as if it is a single system or independent of existing infrastructure. Instead, EEI suggests for policy purposes, “Smart Grid” should be understood to be an ongoing approach to achieving a "smarter grid" in response to the public interest in maintaining reliability, cyber security, and achieving environmental goals at a lower cost than the traditional grid. More specifically, EEI thinks of the Smart Grid as an approach to customized upgrades to the power delivery system with enhanced communications, information and control technologies that both improve the reliability and efficient operation of the system, in order to serve as a “platform” from which to enable the integration into the power grid of a wide

[2] *Id*.

[3] *Id*.

range of new “applications” such as Electric Vehicles ("EVs"), demand response ("DR"), renewable, variable energy resources ("VERs") (*i.e*., wind and solar), etc. that have great potential to benefit the customer. This is a more appropriate way to refer to the electric industry’s approach to “Smart Grid" because the existing electric grid is already quite advanced. While the addition of new Smart Grid technologies to the existing infrastructure are truly transformational in effect they are foundational in nature and will be implemented in a manner that is ongoing and evolutionary.

This nation's experience with the growth of the Internet teaches us that this platform and the applications integrated therewith will develop in ways which are unimaginable today. We can expect that as the Smart Grid evolves, new businesses are likely to develop, involving both utilities and third parties. Accordingly, electric utility companies, which will be involved in the deployment of the vast majority of the Smart Grid infrastructure, must have the flexibility to effectively manage the implementation of these new technologies while maintaining the reliability and security of the grid.

The Smart Grid will offer electric utilities, customers and the nation a wide range of benefits for all of the many reasons identified by the Department. However, the Department is correct to recognize that while many of the costs of deploying Smart Grid infrastructure and technologies may be readily quantifiable, the benefits in some cases (while no less real) may be less easily quantified. It is important to recognize that the utility-side benefits are just as tangible as the customer-facing benefits and that these utility-side benefits accrue to all ratepayers. The fact that some of the systemic benefits of the Smart Grid are not easily quantifiable creates unique, but not insurmountable, questions for utilities and regulators alike. These uncertainties should not be permitted to hinder deployment of Smart Grid technologies. It is possible to develop a business case for Smart Grid investment based on traditional principles. It will be important that state regulators establish the rate policies necessary to support construction and promote innovation as well as the appropriate fair market rules.

The many complex issues related to the Smart Grid require close collaboration encompassing all major stakeholder groups including regulators (state and federal), the Administration, consumer advocates and industry. With regard to the private sector, the collaboration should be industry-wide. Such collaboration on customer education and engagement is essential. Providing for customer education at all levels will be critical in order to maximize participation, and to avoid backlash — caused by lack of understanding of the full range of Smart Grid benefits — which could derail if not significantly delay the implementation of the Smart Grid.

The electric utility industry, technology companies, consumer advocates and government stakeholders must also collaborate to develop options for integrating Smart Grid technologies and systems with legacy technologies and systems. Government and industry must continue to work together to address critical cyber security issues because reliability is a mandate not an option and they should develop a public/private partnership data sharing model to improve grid reliability and performance. Similarly, collaboration is important with regard to interoperability standards, issues pertaining to data access and privacy and the introduction of EVs.

The federal government will have a critical role to play in helping to develop and fund the necessary public education programs. It will also have an important role in allocating the spectrum necessary for Smart Grid operations. Likewise, federal leadership in establishing important web portals and Smart Grid testing and risk mitigation centers will be essential.

Federal leadership in these areas and the need for collaboration does not mean however that the important role of the states is somehow negated. Just the opposite, the role of the states must be respected because many of the solutions will be state or regional in nature and because of the pivotal role that state regulators play in overseeing retail electric rates and charges.

For its part, EEI has taken the lead by initiating an industry-wide collaboration process. EEI members are actively engaged in developing potential Smart Grid scenarios to establish a long-term vision of the Smart Grid and to identify best methods to transition to the Smart Grid. The goal of these efforts is to develop a Smart Grid technology game plan that appropriately balances state and federal policy objectives, customer needs, business objectives, and the adoption of new Smart Grid technologies. This effort to develop a "roadmap" is similar to the Department's effort to develop a "Path Forward." The electric industry is committed to working in conjunction with the Department, the Administration and all other stakeholders to bring this process to a prompt and successful conclusion. As a nation we do not have the option of delaying investment in the Smart Grid.

COMMENTS

I. INTERACTIONS WITH AND IMPLICATIONS FOR CUSTOMERS

EEI agrees that among the potential benefits presented by Smart Grid deployments is that some customers could better understand their energy consumption and associated patterns through greater access to information and the ability to better manage their usage. It is therefore useful for the DOE and the Smart Grid Subcommittee[4] to examine the interactions with, and

[4] The Smart Grid Subcommittee was developed by the National Science and Technology Council (NSTC) Committee on Technology to establish an interagency process that will further the goals of the administration's energy plan and the American Recovery and Reinvestment Act. Specifically, the Smart Grid Subcommittee will

implications for, customers in order to achieve a better understanding of the context in which Smart Grid technologies, business models and policies operate. However, such an analysis must recognize that "customers" are not homogenous. As discussed below, different customers will have a different sense of what are the most important Smart Grid applications. Furthermore, given that some customers have not shown an interest in focusing on various pricing options or on other opportunities for savings, it is reasonable to expect customer preferences and actions to be substantially influenced by access to information about the Smart Grid and the various applications for which it will serve as a platform. Smart Grid implementation, then, represents an evolutionary process requiring customer engagement and feedback on the needs and preferences of utility customers as they develop.

A. Although Most Smart Grid Applications Will Benefit All Customers, Some Will Benefit Customers Differentially.

EEI applauds the DOE's recognition of the critical distinctions between utility customer classes, and it agrees that this is an important issue when considering Smart Grid policy and logistical challenges. All customers will benefit from the deployment of some Smart Grid technologies, however it must be recognized that different customers may have differing needs and preferences for specific Smart Grid applications. Therefore, the benefits of Smart Grid applications may impact different groups of customers in different ways. Also, there is no such thing as a "standard" Smart Grid configuration: each is unique, and designed to serve a unique set of customers in a distinct geographic/climatic setting, with a unique set of legacy systems. Accordingly, the particular types and benefits of Smart Grid applications will necessarily vary based on the unique systems into which they are integrated.

---

provide policy recommendations and guidance for development of the administration's Smart Grid policy. *See* http://www.smartgrid.gov/news/nstc_subcommittee.

For most Smart Grid purposes, electric customers can be divided into two separate classes: (1) residential customers and (2) commercial and industrial ("C&I") customers. Both of these customer classes can be further parsed into smaller segments representing a multitude of usage needs and requirements. Accordingly, various customers will have different expectations, needs and benefits from the deployment of Smart Grid technologies and applications. These customer distinctions further underscore the need of policymakers and regulators at all levels to understand the nuances of Smart Grid technologies and applications in order to develop an effective policy and regulatory framework.

With this in mind, the following applications are likely to be present (to some extent) in most Smart Grids, and to provide benefits for all customers:

> **Voltage Monitoring –** The ability to maintain more constant voltage levels throughout the system. This is experienced by customers as improved power quality, and can be very important for customers with digital equipment (which is proliferating in our post-industrial information economy). More constant voltages also reduce line losses, which is a direct saving for customers.
>
> **Substation Monitoring & Diagnosis and Improved Fault Detection & Load Management –** Distribution automation applications that are not seen by customers, but which are experienced as increased reliability.
>
> **Distribution System Management –** The improved ability to integrate and control distributed resources, both energy supply and storage. These applications can be very important for customers with on-site generation or energy storage. Moreover, as variable sources grow on utility systems, these applications will be experienced by all customers as increased reliability.
>
> **Demand Response –** Tools that allow customers to control their costs by avoiding energy usage during high cost periods. Among the applications in this area are time-differentiated price signals (e.g., time-of-use rates, critical peak pricing, peak time rebate, real-time pricing, interruptible rates, etc.), interval metering, in-home displays, dashboards, orbs, etc.), direct load controls, and control systems on the customer side of the meter (home area networks, energy management systems, etc.). These kinds of applications can be very important to customers interested in controlling their electricity costs.

> **Outage Management –** Outage management systems that integrate the utility's customer information system with a model of the utility's electric delivery system. This is beneficial to customers in the form of faster outage restoration, and can be extremely important to customers in remote or hard-to-serve locations. Like many Smart Grid benefits, utility outage management systems may vary based on the needs of an individual utility's customers and geographic location, and is not conducive to a "one size fits all" approach.

Other Smart Grid applications may benefit different groups of customers in different ways and at different periods of time. The dollar value of associated costs and benefits of Smart Grid applications varies by utility, and the while Smart Grid-related costs may be incurred upfront, certain benefits of the Smart Grid may not be realized by some customers as quickly.

Improved customer engagement, including education and communication, is therefore fundamental to improving customer understanding and acceptance of the Smart Grid and its range of benefits. These efforts should take into account different customer needs and preferences for Smart Grid applications, and should also highlight the broader public interest benefits of the Smart Grid. In the absence of the Smart Grid, utilities would still need to undertake costly distribution system upgrades (*i.e.*, to replace aging components, and to serve new customers) to address the system needs described above. Smart Grid technologies, however, offer better and more cost-effective ways to meet these needs and to build reliable electric systems. The federal government can play an important role in facilitating state efforts to engage customers and, therefore, EEI applauds DOE for its leadership in developing the Smart Grid Information Clearinghouse as a first step towards the objective of proactive consumer education.

1. All Customers, Including Low Income Customers, Have the Potential to Benefit from the Smart Grid.

While there is uncertainty that Smart Grid applications will always benefit low income customers, there exists at least the potential for such applications to do so. For instance, a study released earlier this year by the Institute for Energy Efficiency concluded that price responsiveness does occur among low-income customers.[5] Based on the programs studied, it also found that in some instances price responsiveness within this demographic was about as high as the responsiveness seen by other residential customers.[6] To the extent low-income customers respond to dynamic prices, they will benefit from demand response applications on the Smart Grid.

Utilities, working under regulatory supervision, have for many years instituted programs to protect at-risk customers as the need is identified, and they will continue to do so as new rate and service innovations are introduced. Moreover, in some cases, at-risk customers will choose not to participate in such new rate and service programs. If they do choose to participate in these programs, then appropriate safeguards should be considered to address issues that at-risk customers confront.

B. Customer Engagement is Critical in Order to Avoid Consumer Backlash.

Customer engagement at all levels is critical for an effective Smart Grid. Generally, customers have not been exposed to the various concepts and unique issues introduced by the Smart Grid, and many customers are unfamiliar with the changes and related benefits that the Smart Grid will produce. This has proven to be a significant hurdle for some utilities in their

---

[5] *See The Impact of Dynamic Pricing on Low-Income Customers*, The Edison Foundation and the Brattle Group (Updated September 2010), available at http://www.edisonfoundation.net/iee/reports/IEE_LowIncomeDynamicPricing_0910.pdf.

[6] *Id.*

advanced metering initiatives and deployment of smart meters. This lack of understanding has led in some instances to consumer backlash which could imperil the deployment of the Smart Grid and thereby threaten not only grid reliability but delay the realization of other important Smart Grid benefits including demand response energy efficiency, innovation and economic development. In all instances, the types of customer education offered must account for the differences in customer classes and within customer classes.

Residential consumers, in particular, often may not completely understand the full range of benefits made available through the use of new metering equipment, including the opportunities for cost savings. These customers typically do not understand the time-varying value of electricity, dynamic pricing structures, or DR benefits.[7] Residential consumers often do not see the impact of higher energy-consuming products (e.g., big-screen televisions, refrigerators, air conditioners, electric water heaters, etc.) on their total energy usage, and they frequently do not understand the rate design mechanisms that account for variations in factors outside the control of their utility (e.g., fuel costs, weather, etc.). In fact, in the past, some customers have been insulated from the impacts of these factors through flat bundled rates. Consequently, an adequate understanding of these rate design mechanisms is important, as changes to utility bills unrelated to changes in energy consumption can have a negative impact on consumer perceptions of Smart Grid benefits, especially when those benefits become muted due to non-consumption based factors.

As discussed earlier, proactive utility communication and education efforts are vital to avoiding a consumer backlash against the Smart Grid. These efforts require outreach through

[7] For those customers who do understand, and have participated in DR pilot programs, evidence about their response is documented in reports on the results of DR pilot program. *See, e.g., The Impact of Dynamic Pricing on Low Income Customers*, Institute for Electric Efficiency, September, 2010; *Moving Toward Utility-Scale Deployment of Dynamic Pricing in Mass Markets*, Institute for Electric Efficiency, June 2009; *2008 Ex Post Load Impact Evaluation for Pacific Gas and Electric Company's SmartRate Tariff*, Final Report, December 30, 2008.

different types of media channels, multiple languages and other innovative techniques. For example, Oncor Electric Delivery ("Oncor"), as part of its advanced metering deployment initiative, reached out to its customers through mailings, leaflets, newspaper articles, and door hangers.[8] The utility dispatched a mobile "experience center"/demonstration truck that went directly to the communities, and hosted a series of events across its service territory to enhance communications with the public. Oncor also created a smart meter verification plan to gain customer confidence and acceptance. This verification plan included independent meter testing and information for consumers. Having undergone this meter rollout initiative, Oncor discovered that early communication with customers is critical, and should occur far in advance of meter deployment. Oncor's communication efforts involved proactively alerting customers of new equipment, and educating customers on weather-related impacts on energy consumption. Oncor noted the importance of engaging utility employees as well, and of managing customer expectations of the Smart Grid. Outreach efforts, such as those undertaken by Oncor and others, should be customized to take into account the particular customer base as well as various regional differences.

In addition to proactive communication and outreach efforts in advance of smart meter deployment, utilities should engage customers throughout the deployment period through innovative media channels, including social media outlets, Internet-based energy consumption tools, and email/text notification programs to reach customers.

It is also important for utilities to attempt to anticipate the needs of the different communities in their service territories during smart meter deployments. As such, utilities should consider participating in community outreach events and facilitate customer focus groups

---

[8] *See* Oncor, Advanced Metering Deployment – Issues, Concerns and Communications Strategies (Oct. 6, 2010), available at http://www.swedeus.org/SWEDEpdf/2010/Oncor%20Advanced%20Metering%20System.pdf.

in advance of and during smart meter deployment in order to gain feedback from customers. The insights gained from such efforts could be used to make tactical changes during deployment. Each respective utility could utilize this flexible approach based on the specific needs of their customers. For example, education and outreach efforts could be provided in multiple languages based on the unique demographics of the different communities served. This flexible approach will enable utilities to better anticipate and adjust to the needs of customers throughout smart meter deployment.

In considering behavioral barriers to the adoption and use of customer information feedback systems as well as DR and energy management it is important to recognize that residential customers are highly diverse in their knowledge, interests and motivations. Therefore, market segmentation studies are critical for identifying groups of customers with similar interests who will respond to similar incentives, and for effectively targeting messages to these groups. For this reason, DR service providers frequently conduct market segmentation studies. Based on customer interviews, consumers are distinguished based on demographic factors (e.g., age, income, size and/or age of household, number of children, degree of computer ownership and Internet access, and degree of environmental motivation). Generally, these studies reveal that customers who are younger, highly educated and who desire to protect the environment are among those most likely to participate in DR programs.

Given that customers differ in their needs and preferences for Smart Grid applications, and that these differences vary uniquely between service territories, utilities are best positioned to identify various individual customer segments, and to target messages to these groups. Moreover, many EEI members are actively engaged in studying customer responses to time-differentiated pricing to determine how to best maximize the cost-effectiveness of utility DR programs.

As part of these efforts, there is also a need for broad public education about the electric system generally and about the benefits of Smart Grid technologies and applications. Lack of customer knowledge and understanding about energy in general, and DR and the Smart Grid in particular, is a significant barrier to the use and future success of Smart Grid technologies. The federal government (with industry stakeholder support / involvement, etc.) can provide national leadership through broad public education messages to residential and C&I customers about the uses and benefits of the Smart Grid. DOE can similarly serve as a clearinghouse for Smart Grid, by providing guidance, sponsoring conferences and providing financial support for educational initiatives. EEI emphasizes that efforts to market the Smart Grid to utility customers is best handled by the utilities themselves, who have a unique awareness of the issues, concerns and expectations of utility customers within their service areas.

EEI also suggests that DOE should work with the Federal Energy Regulatory Commission ("FERC"), Federal Trade Commission ("FTC"), the National Association of Regulatory Utility Commissioners ("NARUC") and others to develop a forum for broad Smart Grid customer education. As a starting point FERC staff's National Action Plan on Demand Response ("NAPDR") which identifies, as an element of its National Communications Program, a Communications Umbrella ("Umbrella").[9] EEI urges DOE to consider the Umbrella as a useful tool to shape the structure and content of a national Smart Grid education campaign. The Umbrella, which includes research and message development activities to produce communications products for use at the state and local levels, aims to develop "adaptable" messages to reframe DR in customer-friendly terms using a set of modules and applications that

[9] *See National Action Plan on Demand Response*, FERC, Docket No. AD09-10, at Section 2.2 ("National Communications Program") (June 17, 2010), available at http://www.ferc.gov/legal/staff-reports/06-17-10-demand-response.pdf.

address multiple topics for multiple target audiences (e.g., price-responsive demand, using DR to provide operating reserves and ancillary services, partnering DR with variable generation resources, energy use reduction, load shifting, and smart energy principles). The Umbrella also recognizes the need to develop materials that can be tailored to large C&I customers at the state and local levels. EEI is an active participant in the National Action Plan Coalition for DR that is working to implement FERC's NAPDR, and urges DOE to provide financial support to this valuable effort. A lack of customer understanding about the Smart Grid underscores the need for DOE to support development of the NAPDR's Umbrella.

II. INTERACTIONS WITH LARGE COMMERCIAL AND INDUSTRIAL CUSTOMERS

All too often the C&I segment of utility customers is overlooked in the discussion of the Smart Grid, and we commend the DOE for its efforts to seek input regarding the benefits from, challenges to, or policy needs for Smart Grid deployment which might be unique to this market segment. In many ways C&I customers can realize larger and more immediate cost-related benefits from the Smart Grid than residential customers, especially in retail access states where large end-users may participate in wholesale electric markets. A number of market drivers (e.g., federal incentives, renewable energy projects, green certifications and DR programs) have influenced C&I customers to implement certain operational initiatives such as demand side management ("DSM"), which may include both energy efficiency ("EE") and DR.[10] All of these initiatives benefit from Smart Grid deployment.

A. Certain Smart Grid Benefits Are Unique to Commercial and Industrial

[10] While EE, DR and DSM have historically been used interchangeably, creating some confusion, both EE and DR are components of DSM. EE targets energy reduction (MWh), which includes energy conservation measures and efficiency upgrades, and has some coincidental impact on peak demand reduction. DR targets load reduction (MW), which includes peak shaving and valley filling strategies, and may have minimal impacts on energy reduction.

Customers.

The Smart Grid offers considerable benefits to C&I customers by enabling them to realize significant cost savings through the enhancement of various DSM initiatives (e.g., load profiling, cost allocation, green buildings management, power quality, energy management, DR, etc.), and by facilitating opportunities for coordination of distributed generation of intermittent renewable energy resources. C&I customers can realize these benefits through a number of customer-facing and utility-facing programs, including aggregated DR, specific site pricing signal responsiveness, and operational management decisions that can be deployed on a C&I company-wide scale through employee and equipment procedures. Allowing C&I customers (e.g., retail stores, restaurants, hotels, manufacturing facilities, etc.) to customize their specific DSM usage based on their business operations, geographic location and business segment, ensures that they can maintain the sustainability of their business.

Smart Grid technologies may also provide C&I customers with improved access to DR programs. For instance, energy management systems made possible by the Smart Grid could enable effective load aggregation options, making DR programs more accessible for C&I customers that may not meet certain minimum kW-per-site (e.g. 100 kW) requirements. This may be particularly beneficial to C&I customers whose main source of energy consumption is lighting and HVAC systems, and whose peak hours of operation occur during DR events (*i.e.*, retail stores). Some C&I customers, then, may experience larger or more immediate cost-related benefits from the Smart Grid than residential customers, especially in retail access states where large end-users may participate in wholesale electric markets.

B. Commercial and Industrial Customers Face Several Other Unique Challenges Related to Smart Grid Deployment.

C&I customers face other unique changes related to the Smart Grid resulting from, among other things, their use of sophisticated energy management systems and their participation in DR programs. Established DR programs relying on traditional transmission and distribution systems often require participating customers to commit to long periods of potential load curtailment, an arrangement that is often not tenable for many C&I customers. In contrast, a Smart Grid could allow DR customers to participate in short-duration, dynamic events with as little as two to ten-minute notifications (as opposed to longer notification periods of a half hour or more). Customers could also be provided with "always on" capabilities in certain circumstances. C&I customers using energy management systems to aggregate loads on the Smart Grid could also stagger their load drops among different locations within a regional transmission organization ("RTO"), independent system operator ("ISO") or service territory, thereby making certain C&I customers' participation much more cost effective, allowing them to enjoy potential energy savings.[11] These capabilities may also be carried over into the residential and small business markets, given the increasing number of utility pilot programs and third-party products and services in the marketplace that may already have deployed in-home or small-scale energy management systems.

While some C&I customers may experience more immediate cost-related benefits from the Smart Grid, a potentially significant hurdle for C&I customers is that realization of these benefits might be delayed considerably where state regulatory commissions reject utility Smart Grid proposals. Such uncertainty may make it difficult for C&I customers to plan for and invest in Smart Grid applications. Retail backlash by residential customers, then, presents a challenge

[11] C&I customers' ability to take advantage of these potential options depends on their capacity to aggregate loads.

to all Smart Grid development and a potential obstacle to bringing the benefits of the Smart Grid to C&I customers.

C. Satisfying Unmet Policy Needs and Promoting Infrastructure Coordination Can Facilitate Increased and Faster Participation by Commercial and Industrial Customers.

Many C&I customers who are retail businesses are hesitant to join DR programs because their customers and employees are not familiar with DR. They often struggle with decisions to reduce load during DR events. Of those C&I customers that do participate in DR, many post signs at the entrance of their businesses notifying customers of their efforts. For such C&I customers, increased public education about the need for, and benefits of, DR can translate into increased willingness to participate.

There can also be synergies for C&I customers in communications campaigns aimed at residential customers, which stimulate demand for energy-related products and services the C&I retailer sells. Coordinated communications of this kind can benefit both the grid and C&I customers.

Finally, as acknowledged by DOE, some C&I customers are sophisticated energy users who may already have made capital expenditures to install advanced energy management systems. These existing systems should be taken into account when planning new Smart Grid infrastructures and applications, to ensure increased and faster participation from C&I customers with existing energy management systems.

III. ASSESSING AND ALLOCATING COSTS AND BENEFITS

The Department has asked about the costs and benefits of the Smart Grid, as well as how these costs should be allocated. Additionally, the Department asks about factors that should be considered in a cost-benefit assessment. Overall, it is critical to note that many of the benefits of the Smart Grid are not easily quantifiable, which creates unique and complex problems for utilities and regulators attempting to engage in cost-benefit analyses to determine what Smart Grid technologies and infrastructure to upgrade or deploy**.** While, as discussed herein, these issues may be problematic, EEI emphasizes they are not so insurmountable as to delay or derail the Smart Grid.[12]

A. While the Benefits of Smart Grid Will Vary, These Uncertainties Should Not Hinder Smart Grid Development or Delay Smart Grid Implementation.

Assessing the benefits of the Smart Grid should not simply involve a comparison of Smart Grid versus no Smart Grid, but rather a comparison of Smart Grid versus the considerable investments in generation and other electric infrastructure that will be required to manage projected load increases with a traditional grid. Utilities and policymakers face challenges in making the case for Smart Grid investments in the context of regulatory ratemaking because many benefits of the Smart Grid are difficult to quantify and not easily understood. Smart Grid investments in transmission and distribution systems, for instance, may provide operational benefits that enable utilities to meet state and federal regulatory and legislative policies (e.g. renewable portfolio standards). These benefits may not be obvious to customers. Even with emerging advancements in energy technologies, telecommunications and computing technology capabilities, the electric power delivery system over the next ten years will likely continue to consist of long-standing and proven technologies, such as conductors, poles, towers and transformers. Smart Grid investments will often enhance rather than replace existing assets, resulting in a more evolutionary than revolutionary transition.

[12] See generally discussion at section VII ("Managing Transitions And Overall Questions"), *infra*.

In order to best determine when the benefits of Smart Grid investments are realized, the timing of these benefits must be considered as well as the length of time over which these benefits occur. Generally, the majority of Smart Grid costs will be incurred near the beginning of the study period, while the benefits will be spread out and realized throughout the life of the investment. Cost-benefit analysis may bundle or package together these investments in several applications if those applications are needed to function together or provide otherwise unachievable synergies, or if they are reliant on a common infrastructure investment. However, to the extent it is feasible to separate individual Smart Grid applications, these applications could still be subject to individual cost-benefit analysis based on their stand-alone incremental costs and benefits.

Some key assumptions underlying the cost-benefit analyses may have a high degree of variability and/or uncertainty. A description could be included of the uncertainties associated with estimates of costs and benefits over the term of the payback period. A sensitivity analysis of the projected costs and benefits of the investment(s) to variables and assumptions could be included, which could serve to identify key variables from the cost-benefit analysis such as benefits contingent upon specific actions or behaviors. EEI wishes to emphasize that any sensitivity analysis, however, will vary based on individual jurisdiction.

1. The Fact that Traditional Ratemaking May Have Difficulties Quantifying Certain Public Interest Benefits Is Not an Insurmountable Barrier.

Assessing benefits of the Smart Grid is a complicated task, as many benefits realized through Smart Grid technologies are not easily quantifiable. While direct benefits might be more easily recognizable by customers, other benefits, such as system-wide benefits, may not be immediately seen by customers but should not be ignored by regulators. In addition, as discussed above, Smart Grid benefits may vary between customer classes and various segments of energy users.

When considering the value of the Smart Grid, it is important to understand that there are several categories of benefits, some of which extend beyond the ratepayer to society at large and are of significant value, but which may not be readily quantifiable. Such public interest benefits of a Smart Grid might include increased energy independence, reduced greenhouse gas emissions, incentives to grow and develop new technology sectors in the economy, and a higher level of electric system reliability, safety and security. In addition, many Smart Grid investments are foundational in nature, and facilitate the incorporation of ongoing system enhancements, including distributed generation, plug-in hybrid electric vehicles, and the capability to manage a more decentralized electrical system with widespread renewable energy resources and storage. The full value of these initial investments, then, will be difficult to fully quantify at the time they are made, as much of their full value rests in their ability to support future Smart Grid applications as they evolve. This will present a challenge for utilities attempting to monetize the value of benefits in the framework of traditional ratemaking. In addition, it is likely that in many instances the whole of the Smart Grid will be greater than the sum of the parts: the aggregate value of independent Smart Grid components – when integrated into a larger system –will likely exceed the individual benefits separately identified for each component. Computer model simulation tools can be useful in assessing the regional economic and technical benefits of Smart Grid investments.

It is reasonable, however, to expect that a business case could be made for any investment or set of investments in Smart Grid technologies in which relevant costs or benefits are identified. In this context, "relevant" would mean: (1) costs and benefits that are expected to have a tangible impact on the utility's decision to invest and/or the regulator's decision to approve the investment; and (2) transparent costs and benefits that can be quantified and monetized. Costs and benefits presented in such a business case should be incremental to a baseline case, which reflects costs and benefits that would occur if the investment under consideration were not made. Particular care should be taken to ensure no "double-counting" of benefits. Additionally, any costs in danger of being stranded if the investment does proceed must be included in the incremental case. The analysis should include a calculation of the net present value of (incremental) annual cash flows associated with the investment, and should separately identify:

- Costs and benefits directly borne and realized by the ratepayer;
- Costs that will not be recovered through rates, *i.e.*, that will be borne by other parties (e.g., utility shareholders, third-party investors, taxpayers, or third party service providers); and
- Benefits that will flow through channels other than regulated rates (*i.e.*, positive externalities), both to ratepayers and to other classes of beneficiaries.

For the various reasons discussed *supra*, many benefits may not be readily quantified, may extend beyond the ratepayer to a broader class of recipients, and/or may not be fully realized until other investments or changes in the electrical grid occur. Regardless, these benefits should not be ignored, but should be listed, described and, wherever possible, estimated. While regulators can be expected to evaluate a business case primarily in terms of the tangible cost and benefit streams specifically linked to ratepayers, this broader class of benefits should still be considered in the general evaluation.

In evaluating proposals to invest in Smart Grid projects, state regulators should pursue only the most cost-efficient and effective projects that will deliver the best options for ratepayers.

However, regulators in different jurisdictions will face difficulties assessing Smart Grid proposals due in large part to the difficulties in quantifying and comparing the costs and benefits of these projects.

A fair assessment of the relative value of Smart Grid programs involves a comparison of the costs and projected implementation scheduled for energy efficiency and renewable energy programs and their associated benefits. Not all of the costs and benefits associated with investments in energy efficiency and renewable energy programs are certain, and they often involve a range of probabilistic outcomes. Alternatives should therefore be compared using the same methods of incorporating uncertainty as described above, such as the use of sensitivity analyses.

However, when making these comparisons, it is important always to consider the public interest benefits of Smart Grid projects, including their capability to serve as enabling platforms to support increased energy efficiency and to facilitate the integration of renewable energy programs. To the extent these inherent benefits exist and can be quantified, they should be included in any analysis of the relative value of Smart Grid programs.

It is highly likely that all Smart Grid proposals to come before regulatory agencies will offer substantial benefits for customers in a variety of forms. Rather than attempting to select from among several well-qualified competing alternatives (many of which in fact may not be strictly comparable), in many cases the more appropriate question for regulators is what the optimal Smart Grid order of investment should be. Some regulatory agencies, for example, might place a special value on Smart Grid technologies that enhance a utility's ability to incorporate a more diverse portfolio of new generation sources and/or manage those sources more efficiently and reliably.

2. The Costs and Benefits of AMR and AMI Are Not Always Comparable, and Such a Comparison May Be of Limited Guidance.

Utilities' Smart Grid investment decisions will vary based on individual utility policy goals and jurisdictions, as well as the legacy systems in place in a particular utility's service area. Utilities with existing automated meter reading ("AMR") systems might opt to upgrade their existing infrastructure, or to install new advanced metering infrastructure ("AMI"). Utilities with AMR systems in place will start from a different perspective, and may make incremental changes and upgrades to their existing systems to better incorporate evolving Smart Grid technologies. Utilities' business decisions to implement Smart Grid technologies and applications will necessarily consider legacy systems, replacement of these systems, and incremental upgrades. Thus, any attempt to compare the costs and benefits of AMR and AMI will prove complicated.

A utility's choice between AMR and AMI will depend on customer preferences, state regulatory policy, and the level of communications and metering infrastructure already in place within a utility's system. In addition, the point of reference for any comparison will differ markedly based on the region and jurisdiction in which a utility is located.

In general, utilities and state regulatory commissions need to weigh the timing and magnitude of benefits delivered by cost-effective technologies available today (e.g., AMR and other customer-targeted technologies) against the pace of technology improvement and cost reduction of newer technologies (e.g., AMI). Newer technologies may eventually make existing technologies obsolete. However, as long as the revenue requirement for current solutions can be offset by operational savings during the same period in which customers receive the benefit of the current technology, state regulatory commissions should be open to supporting further investment in current technologies that may be incompatible with the end-state. This will allow utilities to provide near-term benefits to customers. However, if the business case indicates that this strategy would cost more in the long-run, then it should not be adopted.

While the costs and benefits of AMR and AMI reveal a far-from-perfect comparison, any effort to evaluate the two must take into account incremental benefits over a baseline case that includes benefits already captured from a preexisting AMR deployment. Labor savings, for example, cannot be claimed as an incremental benefit under AMI if they have already been realized due to the preexisting deployment of AMR. However, benefits that will arise due to the two-way communication made possible by AMI, such as enhanced DR, would be counted as incremental.

B. Smart Grid Implementation Progress Should be Measured Using Underlying Benefits Estimates.

As a general principle, Smart Grid-related investments to modernize transmission and distribution infrastructure are no different than other capital investments in these areas and, therefore, should be treated similarly. The benefit estimates identified in the business case can be used as milestones for measuring progress. As additional benefits emerge, or as certain benefits are not fully materialized, Smart Grid implementation milestones should evolve accordingly. Further, implementation progress milestones can also be used as the basis for benchmark-type incentives in certain instances.

For some companies and jurisdictions, a phased-in approach for Smart Grid investments may be beneficial. Large Smart Grid investments could be structured for implementation in time-phased stages, for evaluation purposes, if doing so does not have a significant deleterious impact on the viability of the investment. Structuring investments in this manner may facilitate the verification of benefits and provide opportunities for cessation of investments in the event that initial assumptions and estimates of costs and benefits prove to be inaccurate; thereby minimizing the potential for future stranded investments. Similarly, in some instances pilot programs have proven to be extremely valuable in identifying Smart Grid benefits.

C. Smart Grid Costs Should Be Allocated Based on Traditional Principles.

EEI encourages regulators to work together to provide as much certainty as possible for cost recovery for needed Smart Grid projects in retail rates. Smart Grid costs should be allocated consistent with historical transmission and distribution allocations, which have traditionally been done on a cost-causation basis. All customers have an interest in and will benefit from the repair, replacement, or upgrade of the utility's delivery system. Therefore, Smart Grid investments made and expenses incurred to improve system-wide performance and/or reliability would most likely be allocated to all customer classes on the basis of customer counts, peak demand, energy, or a combination of all three.[13] However, when following the principle of cost-causation as the basis for allocation, there are some aspects of the Smart Grid that may be appropriately allocated to certain customers. Smart technology that is deployed on behalf of specific customer classes or specific customer(s) could be assigned on a direct basis to those customer(s) or classes enjoying the benefits. For instance, if smart meters are provided only to customers in a single service classification, the allocation of costs of those meters may be focused on the customers in that particular service classification.

[13] Costs should be allocated to all market participants. In a fragmented energy marketplace that ranges from municipalities and other governmental energy providers to shareholder-owned utilities all the way to individual energy owners/operators, there should be no "free riders."

In general, there will not be one identified group of beneficiaries of Smart Grid that would necessitate a special effort by state regulatory commissions to ensure that they carry all of the cost burden for implementation. Smart Grid technologies will provide benefits to all customers. Smart Grid technologies that are deployed on behalf of any one specific customer class or segment for non-traditional services could be addressed through a new service charge. Again, this is consistent with traditional regulated ratemaking practices, in cases where the costs for equipment or services can be directly assigned to individuals or classes of customers that are identified as the sole recipients of the specific benefits associated with the equipment or service.

Under traditional cost-of-service ratemaking principles, customers would bear the risk if benefits do not materialize as expected, but would also enjoy all benefits in excess of those originally anticipated. However, this does not preclude state regulatory commissions and utilities from exploring alternative regulatory approaches, which would allow risk-sharing through a set of benchmarks linked to anticipated benefits, with incentives to meet or exceed them. In addition, as EEI has stated in previous filings with the Department, in certain circumstances it would be appropriate to allocate an appropriate share of the costs to third party providers.[14]

As the Department correctly noted, the cost of electric power may be distorted to the extent that utilities are required to collect or retain data exceeding that required to provide efficient electric power generation, transmission and delivery services to their particular customers without charging for such access.[15] Cross subsidies may occur if utilities cannot

[14] *See* Comments of EEI, DOE NBP RFI: Data Access (filed July 12, 2010).

[15] See DOE Smart Grid Report, Data Access and Privacy Issues Related to Smart Grid Technologies, at 20 (October 2010), available at http://www.gc.energy.gov/documents/Broadband_Report_Data_Privacy_10_5.pdf.

charge fees for third-party access to such data.[16] "Sound economics and public policy suggest that an entity causing particular costs should pay for those costs…"[17] It is simply not fair to allocate the costs of providing third access to CEUD — data that will be used by these entities for their business purposes — to electric utility customers, particularly those who do not subscribe to the third party services. Under such circumstances, not only would electric utilities be subsidizing the business activities of third party providers but some customers might be forced to pay twice for the privilege — once in utility charges and again in third party mark-ups.

D. While It May be Beneficial for Customers to Be Able to Opt-In to Certain Smart Grid Programs and Devices, This Should Not Include Rights to Opt-Out of Smart Grid Infrastructure Deployment.

The Department asks whether it may be beneficial for consumers to be able to opt-in or out of Smart Grid programs and devices on the customer side of the meter. While the opt-in process for customer-facing programs is not a primary concern for EEI members, it could have an impact on the underlying costs of deployment of Smart Grid infrastructure where, as part of this opt-in process, customers are permitted to essentially opt-out of the programs or devices that provide the more universal features and benefits of the Smart Grid. If customers were permitted to opt-out of these system-wide benefits they would nonetheless, by virtue of the Smart Grid, benefit from the underlying Smart Grid technologies and services. This creates a "free rider" problem to the extent all customers receive the system-wide benefits of the Smart Grid, but not all customers pay for those benefits.

When determining opt-in and opt-out policies, it is important to distinguish between infrastructure and customer-facing programs. If the utility's business case supports the use of a

---

[16] *Id*. at 21.

[17] *Id*. at 22.

specific technology, then the utility should determine how it is best implemented, similar to any traditional distribution infrastructure upgrade. Customer load control devices behind the meter, however, could be left to the customer's discretion (*i.e.*, an opt-in policy), subject to utility intervention where necessary to protect the reliability of the system, absent state law or regulation. Customer pricing programs may be opt-in or opt-out depending on the individual utility's business case, the specific customer class, and the particular risk profile. State regulators should consider these and other factors in determining whether a specific Smart Grid program should permit customers to opt-in or opt-out.

Customers in many cases are already permitted to opt-in to certain customer-facing Smart Grid applications, and EEI generally does not object to this practice so long as utility customers who do not opt in to the specific customer-facing Smart Grid applications continue to pay for the system-wide benefits they receive from the Smart Grid deployment, including costs related to underlying Smart Grid technologies and infrastructure.

Deployment of Smart Grid and AMI is not dependent on customer-facing applications, or on the ability of consumers to opt-in or out of such applications. Most utilities are presently focusing their efforts on the underlying Smart Grid infrastructure, and while there are many consumer benefits to customer-facing programs, underlying Smart Grid technologies and infrastructure will reveal a host of more universal system benefits that all classes of customers will receive, regardless of whether they participate in customer-facing Smart Grid applications. These benefits include increased operating and maintenance savings, as well as improved load management capabilities. All customers should bear cost responsibilities for these universal benefits, regardless of individual customer elections to opt in or opt out of particular customer-facing applications that are made possible by deployment of Smart Grid and AMI.

IV. UTILITIES, DEVICE MANUFACTURERS AND ENERGY MANAGEMENT FIRMS

DOE has asked a series of questions regarding the federal-state relationship, and the need for collaboration with regard to policies, standards, studies and energy programs. Additionally the Department has asked questions regarding proper incentives for electric service providers and the potential of third party firms. Overall, it is imperative that state regulators and the federal government collaborate on issues such as public education, privacy, standards, and energy programs.

A. State Regulators and the Federal Government Must Collaborate on a Wide Range of Issues If the Benefits of the Smart Grid are To Be Achieved

State regulators and the federal government also should work together to address the need for public education in general about energy, and the Smart Grid in particular. As noted previously, lack of customer understanding and support can be a significant challenge to Smart Grid deployment. Unless customers are educated about the value of Smart Grid deployment, there likely will not be sufficient political support for Smart Grid deployment. The public should be made aware of what the Smart Grid is and the full scope of benefits it can provide. The public should also be informed there is no such thing as a "standard" Smart Grid and that to maximize cost-effectiveness Smart Grids must be custom-designed to account for the unique circumstances of each utility (e.g., climate, load, geography, legacy systems, etc.). States not only have traditional regulatory authority over retail electric service and distribution (including terms of entry into those businesses), but also should be encouraged to support various forms of customer awareness and education. Similarly, there is a role for the federal government in providing funding for the development and use of the NAPDR's Umbrella. The FERC/NARUC Collaborative on Smart Grid is a useful forum for coordinating government actions.

State regulators and the federal government also should work together to ensure customer privacy in Smart Grid environments, recognizing that privacy will be key to long-term customer satisfaction with "smart" technologies. A byproduct of the traditional state responsibility over retail electric supply and distribution service is the development of programs, protocols and standards for collection, storage and use of retail electricity consumption information. For many years, states have been dealing with privacy and data issues related to retail electricity consumption, but the federal government has an important role in working with states to develop mandatory certification processes for third parties. Such certification should be a requirement for receiving customer-authorized energy use data. To maintain a certification, entities should be required to demonstrate that they have implemented appropriate safeguards and monitoring and compliance programs and have the financial, technical, and managerial resources to continue doing so. State/federal coordination should be voluntary and not through federal legislation. Customer data privacy issues were addressed in detail in EEI comments filed in the previous DOE RFI.[18]

Finally, the federal government should continue to support the development of interoperability standards, which are key to innovation and commercialization of Smart Grid technologies and applications.

B. Federal and State Regulators Can Work Together to Better Coordinate Wholesale and Retail Power Markets and Remove Barriers to an Effective Smart Grid.

The Department has asked how can federal and state regulators work together to better coordinate wholesale and retail power markets and remove barriers to an effective Smart Grid.

[18] *See* Comments of EEI, DOE NBP RFI: Data Access (filed July 12, 2010).

First and foremost, FERC should continue its collaborative dialogue with state commissions on best practices for coordinating DR. As referenced above, states have a traditional and primary regulatory responsibility concerning retail electricity supply and related markets. Some states have adopted retail unbundling, while others have retained the vertically integrated, franchised public utility model. These policy choices are for the states and should remain with the states. A growing number of states and utilities are pursuing retail-level price-responsive demand initiatives through dynamic pricing (e.g., critical peak pricing, peak time rebates, etc.), and RTOs /ISOs should not offer compensation that preempts or undermines state demand response programs or initiatives.

However, to the extent regional organized markets have been established, EEI notes that FERC is engaged in a variety of policy and rulemaking proceedings that address how DR (and, in particular, DR aggregated at the retail level, consistent with state law) may be most effectively integrated into a regional grid management structure. The issues involved in the FERC proceedings are numerous and beyond the scope of this response. For example, EEI notes that one of the primary issues in FERC-regulated organized wholesale markets is whether DR should receive locational marginal prices ("LMP") similar to those received by generators participating in those markets. An issue under consideration is whether, with accurate (*i.e.*, locational) price signals, DR may reduce wholesale market loads, thereby facilitating flows on the networks serving the market.

C. Demand Response Programs Can Help Maintain Reliability and the Smart Grid Will Significantly Enhance The Performance of These Programs.

EEI believes that Smart Grid technologies and applications can contribute materially to maintaining the already-reliable U.S. bulk electric system. Retail regulatory programs that use pricing, rebates or load control to reduce consumption, known collectively as DR can reduce the cost of maintaining the electric system. DR can foster improved reliability by, among other things, reducing peak demand and smoothing out the "shape" of retail load. Where system operators are not required to respond to changes in demand, there is less risk that major generating units (used to "follow" those changes) will suffer component failures and be forced out of service. DR also has the potential to provide value as a tool for managing increased penetration of VERs (*i.e.*, wind and solar).

It is important to recognize that the Smart Grid will enhance DR performance significantly over what would otherwise be possible; so the benefits of DR will be substantially greater when implemented through the Smart Grid. By way of example, the Smart Grid will allow DR to be automated, thereby enabling customers to set their preferences and let the system do the work of monitoring price signals and dispatching appliances. Research has shown that by automating responses to dynamic prices, the Smart Grid can be expected to double the response from mass market customers, and sustain such response over time. The Smart Grid will also incorporate advanced metering, which provide detailed load data and enables more accurate, timely measurement and verification of DR performance. This, in turn, can lead to expanded DR and DR-related edge services. The Smart Grid will also provide enhanced communications capabilities, which will enhance DR by giving customers better insight into their specific electricity costs and their potential for reducing them (e.g., showing customers costs incurred to date in the billing cycle displays of home energy usages and where efficiency improvements can reduce energy usage, showing them their consumption in relation to other similarly situated customers).

D. New Regulatory Policies Are Needed to Support The Deployment of Smart

Grid Infrastructures.

Investment and innovation in and around the Smart Grid is generally in the public interest. Smart Grid investments can provide efficient and cost-effective means for complying with Renewable Portfolio Standards ("RPS"), reliability standards, and state and federal environmental regulations. Nevertheless, utilities face many challenges in financing and building Smart Grids. On average these technologies are less creditworthy than they were during the last major construction cycle, and traditional regulatory practices and procedures can create barriers to new investment (e.g., by imposing disallowance risks and impeding cost recovery in ways that undermine creditworthiness). New regulatory policies can help overcome such barriers. For example, incentive-based cost recovery policies, commonly known as alternative regulation, can rebalance risk and return in ways that are fairer and more effective for utilities and customers alike.[19] For utilities, up-front approval processes can mitigate the risk of after-the-fact prudence reviews, while construction cost trackers can provide current cost recovery which allows utilities to maintain credit ratings during construction. For customers, pre-defined sharing (*i.e.,* between shareholders and consumers) of costs in excess of authorized budgets and/or the prospect of reasonableness reviews of cost overages can provide strong incentives for utilities to control costs during construction.

In addition, depreciation rates can reflect the shorter economic lives of Smart Grid components, many of which involve data processing and communications technologies that evolve rapidly and are not likely to be in service for as long as traditional utility assets. Rather than depreciating these Smart Grid assets over 20 years, many should be depreciated over 5-7 years. This could enable utilities to deploy newer technologies without concerns over costs in

---

[19] See *Alternative Regulation for Infrastructure Cost Recovery*, EEI and Pacific Economics Group, January 2007, available at http://www.eei.org/whatwedo/PublicPolicyAdvocacy/StateRegulation/Documents/alternative_regulation.pdf.

danger of being recovered. The treatment of undepreciated legacy equipment is another example of regulatory policy.[20] Failure to recover such costs may create a major disincentive to the deployment of new facilities.

E. Fair Market Rules Are Key To Maximizing Ongoing Third Party Participation and Encouraging Continued Service Innovation in Smart Grid Markets.

The potential for third party firms to provide Smart Grid-enabled products and services to customers is very good, whether such products and services are supplied by or through utilities or to customers directly. Utilities and third parties already are partnering to offer services enabled by new smart technologies. For instance, partnerships are providing home energy reports that detail customer energy usage in comparison to their neighbors, data services that manage customer energy usage data via a third party web site, and in-home displays. Other third parties operating independently in the market (*i.e*., operating outside of a contractual relationship with a utility) are working directly with end-use customers to develop DR capabilities. In some instances third parties are aggregating DR among multiple retail customers; in other instances they are working solely with large C&I customers. However, as detailed below in the Reliability and Cyber Security portion of these comments, grid operational data is considered sensitive and proprietary, and will only be shared by utilities with external entities where there is a demonstrated need, consistent with existing FERC Code of Conduct requirements.

To facilitate further participation by third parties and, equally important, to encourage continued innovation in the delivery of new products and services through the Smart Grid, state regulators will need to develop new market rules that are fair to utilities and third parties alike.

---

[20] *See* NARUC Resolution Regarding Smart Grid (July 22, 2009), available at http://www.naruc.org/Resolutions/Resolution%20on%20Smart%20Grid.pdf. ("Smart [G]rid policies and standards should promote a flexible, non-proprietary, open infrastructure that is upgradable to avoid excess costs as a result of obsolescence").

This is critical because such rules will determine the financial incentives perceived by both utilities and third parties. Further, financial or market incentives are essential to stimulating new markets based on the Smart Grid.

Market rules should not over-regulate the market, but should define the limits of acceptable competition on the Smart Grid. They should ensure non-discriminatory access by third parties, but also give utilities an opportunity to supply services on the customer side of the meter. The principles underlying affiliate code of conduct rules may be a good starting point. Within such frameworks, a key challenge for policy makers will be distinguishing market power abuse from competitive advantage. The former hurts the public, the latter <u>benefits</u> the public. If utilities are able to realize earnings from the sale of value-added services on the customer side of the meter, they should be allowed to keep them: earnings from premium services should <u>not</u> be imputed against the revenue requirements for regulated services. This is critical to the development of innovative new customer-facing services on the Smart Grid, for utilities as well as third parties: if utilities have an incentive to develop new services they will, and they frequently will partner with third parties to do so.

F. Third-Party Testing and Certification Initiatives are Needed to Assure that Smart Grid Technologies Comply with Applicable Standards.

Smart Grid components must be tested and certified to ensure compliance with interoperability standards, although it is too early to assess which third parties should be involved. The Testing and Certification Phase of the National Institute of Standards and Technologies ("NIST") Smart Grid Interoperability Standards Project effort has not yet started. Presently work has begun on requirements and certification criteria for testing and certification laboratories. The discussions as to what the testing and certification laboratories will be testing and/or certifying has yet to begin, and the question of whether or not cyber security will be a criterion in the testing and certification process has yet to be addressed. EEI believes there is insufficient coordination among the many independent groups doing testing, or proposing to do testing, and that there should be a certifying body to oversee compliance with testing and certification procedures. EEI also believes that cyber security must be included as one of the criteria for testing.

Another key issue is liability for damages caused by the failure, or poor performance, of Smart Grid components. Utilities cannot take sole responsibility and liability. Product manufacturers and third party service providers need to be held accountable if their product or service is determined to be responsible for an event that results in economic loss or regulatory penalty levied against the utility.

Finally, federal oversight should help ensure that standards development processes lead to standards that are technology-neutral. The federal regulators and government should focus on results, and should not mandate or implement standards that favor one technological choice or vendor over another. Instead, standards should focus on results or capabilities, and let the market evolve the "winners."

V. LONG TERM ISSUES: MANAGING A GRID WITH HIGH PENETRATION OF NEW TECHNOLOGIES

Given that technologies are evolving and will continue to evolve at such fast rates, it is important that utilities have flexibility to effectively manage the implementation of new technologies while maintaining the reliability and security of the electric grid. Consequently, EEI believes owners and operators of the grid must have flexibility to deal with the transitions that are likely in the next few decades.

A. Pricing Alone Will Not Integrate Large Numbers of Electric Vehicles, Photovoltaic Cells or Wind Turbines.

While pricing is important, it is equally important to make the investments in Smart Grid technology that are necessary to ensure the existence of infrastructure capable of delivering anticipated benefits. Further, customers must be engaged. As discussed above, where customers do not fully understand how to react to pricing signals, the full advantages of a Smart Grid will not be realized. However, pricing, infrastructure and customer engagement do not occur in a vacuum, and there is an efficiency benefit to coordinating these efforts.

Pricing signals may not be enough to encourage changes in customer electricity consumption: additional investments in Smart Grid infrastructure, better modeling tools and power reservation systems are also needed. Investments in Smart Grid technologies will enable electric utilities to more efficiently integrate and manage additional quantities of renewable and distributed energy supply as well as EVs. Initially, these efficiency gains may lead to lower wholesale prices and, in turn, may mitigate future retail prices. As more devices are connected to the grid and more uses are found for those devices, load will likely increase, requiring additional infrastructure upgrades and cost recovery. More than just providing customers prices that encourage off-peak charging, tools are needed to model customer charging behavior and impacts to the electric grid. Given that electricity is a just-in-time commodity, utilities need tools that enable them to predict load at a local level.

Increased numbers of devices connected to the grid may have an impact on the grid's power factor, leading to reduced efficiency on the distribution system. In the case of EVs, prices are not likely to drop until the infrastructure is in place to support the range of devices. For example, in absence of a Smart Grid, if everyone with an EV plugs in at once, straining the infrastructure, prices will go up. There is also concern over third parties that control large aggregated loads having a negative impact on the distribution system.

These investments in Smart Grid technologies will enable electric utilities to more efficiently integrate and manage additional quantities of renewable and distributed energy supply as well as EVs. The impact of integration of large numbers of customer devices will continue to be explored through additional and more sophisticated demonstrations that link customer distributed supply and demand resources into wholesale market and utility grid operations. A significant technical hurdle to be addressed involves the conceptual design of a robust system that can manage the potential for this market to be dynamically linked to grid operations.

Numerous industry efforts are currently underway that seek to address how to reliably and efficiently accommodate a higher penetration of VERs, energy storage devices and EVs into markets. Federal and state agencies should build upon these efforts. One area where additional research is needed is in developing cost-effective energy storage technologies. It is critical that potential reliability impacts that may result from the adoption of new integration rules for VERs be fully evaluated and that solutions be determined primarily on a regional basis, with robust coordination across regions. Regions are organized differently in terms of market structure and have varying amounts of VER potential and different state policy priorities and are therefore in a good position to determine how to most effectively integrate VERs and other devices into the transmission grid and wholesale electric markets. Areas where a high degree of VER penetration is reasonably anticipated may be in the best position to address how to most effectively integrate VERs and other devices into the distribution and transmission networks. Complete uniformity among regions should not be forced or expected and would be unlikely to address the total needs of the system operators, generators, or customers in every region.

Finally, utilities are only in the early stages of implementing the Smart Grid, and as more experience is gained through pilot scale projects that address the challenges associated with integrating large numbers of devices, lessons will be learned that could lead to optimized balancing of the grid. Additional pilot projects are needed at the residential level to gain further insight into customer behavior. Regulators must understand however, that the results from many demonstration pilots will not be necessarily applicable across control areas, regions, or on a national basis.

B. A Flexible Approach to Integration of New Resources Such as Demand Response, Energy Storage and Fast-Reacting Generation that Increases the Ability of Utilities to Balance Power Supply with Load and Meet Public Policy Goals Will Expand the Range of Technological and Customer Responses in a Smart Grid Environment.

The primary objective is to ensure electricity markets encourage entry by new technologies while preserving economic efficiency, security and reliability of the electric system. Regional organized markets' use of DR as a bulk power resource, energy storage and fast reacting generation is under study now by FERC. A bottom up, regional approach is the best approach to identify whether and to what extent products and markets may or should be developed with respect to these resources and how those markets should operate. There will be rapid development of metering and information and communication technologies, resulting in improved metering and data management across the system. Improved predictability of generation and demand will result in new products, services and pricing policies that lead to increased participation of consumers in the market. As DR, energy storage, and other new technologies enter competitive markets, there will be more technologies and resources looking for compensation for the services they provide. A flexible approach to integration is needed so that a range of technologies can serve a diversity of needs based on relative cost. Each can play a role in meeting future demand. The continued unpredictability of generation and demand may also, if proper price signals are established (*i.e.*, the inherent lack of value of non-firm energy is appropriately reflected in pricing), result in innovative market responses.

DR is comparable to traditional forms of power supply to the extent system operators are able to consider the resources to be firm and dispatchable, rather than variable and non-dispatchable. Treatment of DR, however, ultimately varies between regions and state jurisdictions. End-use applications that permit customers to "buy through" price signals or otherwise opt out of participation could be desirable to achieve customer acceptances and stronger penetration levels. Given the structure of many of today's markets, however, such customer flexibility undermines the value of the resources and hence the worth of investment to facilitate large scale development of such interoperability. Substantial efforts should be undertaken to develop DR capabilities and applications that will produce firmer and more predictable responses, yet still provide customers sufficient control over their consumption. Customers generally do not want a utility, the government or any third party controlling or determining when or how they will receive electric service. Yet it is this very control by others that gives DR its optimal value from a bulk power systems and planning perspective.

C. Regulatory Policies Should Optimize the Use of Ancillary Services and Treat Similarly-Situated Resources Comparably.

To the extent possible, regulatory policies should optimize the use of ancillary services and respect jurisdictional boundaries. Any new policy to facilitate the participation of new technologies in the ancillary services market should ensure comparable treatment of similarly-situated bulk power system resources (*i.e.*, resources that are similarly functioning, and with the same operating characteristics) and not grant an unfair economic preference for any particular type of technology.

A full portfolio of firm supply-side and demand-side resources, with multiple capabilities, will be required to support grid stability and reliability. In addition to demand-side resources, traditional supply-side resources will continue to be relied on to provide the flexibility necessary to support integration of VERs and other devices. Non-firm resources generally do not contribute to reliability but could create requirements to increase spinning reserves. EVs should have flexibility to determine load control procedures with the provision of ancillary services. Although federal and state regulators should work together to ensure that any new technologies providing ancillary services meet cyber security requirements, the responsibility of state regulatory commissions for the construction and operation of utility facilities must be taken into account.

New radio frequency spectrum options must be made available to utilities to allow them to develop and implement the reliable wireless networks necessary to support the stringent requirements of the Smart Grid. A new policy where the federal government grants the utilities the spectrum necessary, in a suitable bandwidth, to enable the development of the wireless systems necessary to make the Smart Grid a reality. The spectrum should provide adequate reach and broadband capacity. EEI supports the Utilities Telecom Council ("UTC") in advocating for the sharing of the 700 MHz public safety broadband spectrum with utilities and other critical infrastructure industries.[21]

---

[21] *See* FCC Public Notice seeking Comment on the Technical and Operational Feasibility of Enabling Flexible Use of the 700 MHz Public Safety Narrowband Allocation and Guard Band for Broadband Services, PS Docket No. 06-229 (September 28, 2010), available at http://www.fcc.gov/Daily_Releases/Daily_Business/2010/db0928/DA-10-1877A1.doc.

D. Any Policy or Regulation to Encourage Increased Participation by Distributed Generation, Energy Storage, or Demand Response Should Improve the Economic Efficiency of Markets While Accommodating Regional Differences in Market Structures.

Any policy or regulation to encourage increased participation by distributed generation, energy storage, or DR should recognize that wholesale market structures differ by region of the country. Some regions are characterized by unbundled supply chain, regional transmission operation, regional transmission planning and regional cost allocation. Other regions have retained the vertically integrated service model where generation, transmission, distribution and retail supply are provided under state law. Different industry structures present different issues, challenges and opportunities that may require fundamentally different policy initiatives. Participants and state regulators in those regions are best situated to develop solutions that meet the unique needs of their region.

Compensation for energy services provided by energy storage and distributed generation should be at prices applicable to other resources that provide full functionality of those services in-accordance with principles under the Federal Power Act, and should reflect the quality of the product and the market value of the product. DR resources have different attributes than generation resources, meriting a different compensation structure. Generators deliver energy to the market, whereas DR resources provide voluntary and variable load reductions, which do not have the same economic value as a generation asset. Since the performance and benefits of demand response will vary by state and/or region, then, compensation structures for demand response are best determined at the state or regional level where state or regional differences are more appropriately considered.

E. Collaboration Among All Industry Stakeholders will be Essential to Overcoming the Barriers to the Deployment of Electric Vehicles.

Several major automobile manufacturers are preparing to introduce plug-in EVs (either hybrids or all-electric). This shift in technology could have a major impact on electric utilities, which will be the main source of energy for these cars in the future. The Smart Grid will be essential for large-scale adoption of EVs, for example by providing price signals to customers to recharge vehicles during times of lowest cost and lowest grid impact, or by allowing customers to charge their batteries away from home. Mechanisms need to be put into place to protect the consumer and to alert the utility to planned charging locations.

Collaboration among government regulators, utilities, automakers, device manufacturers and consumer advocates will be essential for developing solutions that encourage the deployment of infrastructure to support EVs while ensuring that federal, state and local objectives are met and jurisdictional boundaries are respected. State regulatory policies must be established to ensure that EVs are integrated efficiently and without causing significant reliability and economic impacts on other customers. Collaborations and partnerships will also enable stakeholders to assess and mitigate any potential system impacts from recharging large numbers of plug-in vehicles from the electrical grid. Collaboration is needed to:

- Enable infrastructure upgrades to maintain reliability: Utilities will need to determine systems requirements and load impacts from EV charging to see if system reliability and load-carrying improvements (new substations, substation transformers or feeders, etc.) or neighborhood distribution improvements (*i.e.*, distribution transformers) are needed to support EVs. A process needs to be developed to notify utilities in advance of where load increases from EV charging will be located so that they can plan for infrastructure upgrades. Early notification is essential. The current permit process for building charging stations does not notify the utility of the location. If a neighborhood purchases EVs all at once and plugs them into charge with no advanced warning to the utility, the utility may not be able to react fast enough to implement the necessary upgrades to accommodate the increased load. The response by the utility may also differ depending on the number of EVs anticipated. In addition, customers must be made aware of any requirements to notify electric utilities of their EV purchase and planned charging location. Any data collected via this process must balance reliability concerns with customer privacy concerns.

- Develop, test, and install local charging infrastructure: Technical standards need to be developed with input from stakeholders for various aspects of charging infrastructure to ensure technical compatibility of electric drive vehicles, charging stations, and utility equipment. A range of voltages is available from a significant number of providers for charging EVs, leading to uncertainty regarding infrastructure upgrades. There is also a need to evaluate the application of the national electric code to the electric installation of charging equipment.

- Establish appropriate rate structures for EV charging: Time-of-day or other rate structures for EV charging are needed to encourage the charging of vehicles during "off peak" hours. Battery storage and vehicle charging will be optimized by automated charging during low-cost periods, enhancing the cost-effectiveness of these technologies. A reservation-type system needs to be built into cars so that utilities can plan for anticipated load increases. An education and outreach program is also needed to educate customers about the benefits of EV ownership and how to most cost-effectively charge their vehicles.

- As vehicle manufacturers introduce EVs to the marketplace, states like Michigan are actively working with utilities to prepare for the effect of electric vehicles on the electric system. The Michigan Public Service Commission ("MPSC") recently approved experimental electric vehicle tariffs (rates) for Detroit Edison and Consumers Energy, both large investor-owned utilities in Michigan. The tariffs will offer several options that include time-of-use rates that customers can use to charge vehicles as well as flat rate options. In addition, at the customers' option, each utility will fund a certain portion of costs for installation of home circuits and charging infrastructure for a certain number utility customers. These programs along with others across the country will provide key insight into the EV ownership experience and electric grid integration.

- Sponsor additional R&D: Collaboratives can provide a valuable role in sponsoring research at universities and other research institutes on PEV-related subjects, customer surveys, and prototype testing.

Almost all of the regulatory policies EEI members believe are critical to the advancement of electric transportation in their service fall within the primary jurisdiction of the states. The federal government should determine the means and methods by which it may facilitate and support the exercise of policy discretion on the state level, including with respect to:

- EV infrastructure cost recovery for electric utilities
- Rate-basing of capital investments for EV infrastructure
- Policies regarding third party providers of infrastructure to ensure that electric utilities are not held liable for the work of electrical contractors installing EV charging equipment.

- Expedited/streamlined electrical permit process for charger installations so that electric utilities know where and when charging stations will be deployed in order to plan infrastructure and supply to meet growing load. This is similar to the requirement for electrical contractors to report to utilities where/when they install A/C units.
- Notifying electric utilities of expected load increases
- Residential EV charging rates
- Charging infrastructure business model opportunities
- State/regional/federal policies that give utilities credit for achieving carbon reduction/clean air goals.
- Tax incentives for utilities developing the EV charging infrastructure and for consumers purchasing the EVs.

VI. RELIABILITY AND CYBER SECURITY

Protecting the nation's electric grid and ensuring a reliable supply of electric power is a top priority for the electric utility industry. As part of this mission, the electric industry recognizes that cyber security incidents may disrupt the flow of power or reduce the reliability of the electric system. Key to the success of industry's efforts in this regard is the ability to provide measures capable of protecting the evolving intelligent network against interruption, exploitation, compromise or outright attack of cyber assets.

Reliability is more than a slogan for the electric utility industry – it is a mandate. In fact, federal and state regulators have significant interest and statutory authority in ensuring electric companies provide an adequate level of reliability. Under the Energy Policy Act of 2005, FERC and the North American Electric Reliability Corporation ("NERC") have adopted mandatory and enforceable Reliability Standards for electric utilities, including cyber security standards.[22]

Thus, utilities take very seriously their responsibility to address cyber vulnerabilities and the security of the computers, control systems, and other cyber assets that are necessary to operate the electric grid. This focus on reliability, resiliency and recovery recognizes risks from natural phenomena to intentional cyber attacks. The utilities will continue to use cost-effective security methods and technologies that mitigate real world threats. This process provides security capabilities that are appropriate to the exposure and the expected consequence of a security compromise (*i.e.*, the assessed risk). Here are just a few of the critical cyber security working groups and bodies that utilities are contributing heavily to on behalf of our customers:

(1) NIST Cyber Security Work Group ("CSWG");
(2) DOE Advanced Security Acceleration Project for the Smart Grid ("ASAP-SG");[23]
(3) OpenSG Utility Security Task Force ("Utili-SEC");
(4) EPRI Intelligrid 2009 research project 161.013 (Security Issues for Advanced Metering, Demand Response, and Integration of Distributed Resources);
(5) ZigBee's Smart Energy Security Standard; and
(6) NERC CIP standards drafting team.

[22] *See* Energy Policy Act of 2005, Pub. L. No. 109-58; *see also Mandatory Reliability Standards for Critical Infrastructure Protection,* Order No. 706, 122 FERC 61,040 (2008) (approving critical infrastructure protection ("CIP") standards).

[23] ASAP-SG is a public-private collaborative effort between electric utilities, the Electric Power Research Institute, and the DOE. The project aims to develop system-level security requirements for Smart Grid systems. The original concept for the project was prompted by Southern California Edison Company ("SCE") and Consumers Energy as a means to address security in the course of procuring advanced metering infrastructure (AMI) systems and components. Security is addressed in a collaborative manner, rather than each party attempting to independently identify and define their own requirements. The project's success in accelerating the development of security standards has caused the project to grow and extend to cover many other Smart Grid applications besides AMI. It is worth noting that the participating utilities identified, right at the outset, the urgency and importance of addressing security for Smart Grid systems, the benefits of doing so in a collaborative industry-wide project, and the power of partnering with the federal government.

In addition, utility representatives look forward to working closely with recently-formed organizations such as the National Electric Sector Cybersecurity Organization ("NESCO") and its affiliated research branch operated by EPRI.[24]

In response to the Department's Notice, EEI describes below some of the sensor and grid automation technologies that electric utilities are deploying to help increase the electric system's reliability and security.

A. Electric Utilities are Deploying Various Technologies to Increase Distribution and Transmission Reliability.

1. Phasor Measurement Units.

Synchrophasors are precise grid measurements now available from monitors called phasor measurement units ("PMUs"). PMU measurements are taken at high speed (typically 30 observations per second – compared to one every 4 seconds using conventional technology). Each measurement is time-stamped according to a common time reference. Time stamping allows synchrophasors from different utilities to be time-aligned (or "synchronized") and combined together providing a precise and comprehensive view of the entire interconnection. Synchrophasors enable a better indication of grid stress, and can be used to trigger corrective actions to maintain reliability.[25] Had this technology been widely available at the time, the Northeast Blackout of 2003 may have been mitigated or altogether averted.

2. Self-Healing Networks.

Today, many EEI member companies are in the process of automating portions of their distribution systems by deploying automated devices such as switches and reclosers that work together in a self-healing network. These networks are designed such that the system detects and

---

[24] *See* DOE Grant Announcement (September 23, 2010), available at http://www.energy.gov/9539.htm.

[25] *See* North American SynchroPhasor Initiative, www.naspi.org.

locates a fault, isolates the fault, and then reroutes power to restore service to as many customers as possible. The devices are configured so as to have the ability to communicate with each other or a central computer and can perform their functions without operator intervention. These automated devices can use a variety of communications infrastructure, such as fiber or wireless networks, to operate.

3. Substation Automation Technologies.

To protect against problems of transformer failure, utilities are deploying substation automation technologies in order to enhance the situational awareness between the utility's control room and its substations. This involves automating the communication of system "visualizations" to the control room including descriptions of the sequence of events and targets for restoration of power. At the bulk-power system level, these enhanced visualizations allow the control operator to see system information beyond its own control area(s).

4. Condition-based monitoring technologies.

Construction of any transmission system requires huge investments. The cost of substation equipment contributes a major portion of these costs. Accordingly, there is need for condition monitoring of vital equipment of substations to assess transformer health as well as to assess the residual life of these equipment for replacement and refurbishment decisions, with the objective of reducing in-service failures through equipment de-rates. Various on-line and off-line diagnostic tools are available for this purpose.

B. Existing Policies Facilitate Operational Data Sharing Between Electric Utilities, RTOs/ISOs or Other Entities that Allows Sensors and Grid Automation to Achieve their Potential to Make Reliability and Performance Improvements in the Grid.

Fundamentally, grid operational data is considered sensitive and proprietary, and will only be shared with external entities where there is a demonstrated need (e.g., for purposes of joint planning, property development, etc.), consistent with existing FERC Code of Conduct requirements. Security of information related to core distribution assets such as substations, circuits and their integral components is critical for the safe and reliable operation of the electrical grid. Open sharing of substation configurations, circuit configurations and their operational state should not be allowed beyond the responsible distribution utility. This includes the physical location of substations and distribution circuit assets. The sharing of grid operational data with third parties may present additional risks. For instance, where multiple utilities share grid operational data with a single third party, that third party may have an inappropriately broad view of operations within or across multiple regions.

RTOs/ISOs, utilities or other entities receiving grid operational data should have monitoring and compliance programs to ensure that their data policies are followed. This should include appointing personnel with authority to ensure that data policies are updated as needed, documented, and complied with. These personnel should review and update terms of service documents, as needed, and address potential needs for training and ongoing awareness activities.

With respect to customer data, customers should be aware of the risks of operating an unsecured home area network ("HAN") and should be responsible for securing their HANs against third party intrusion. Utilities should not be responsible to safeguard data that has been authorized for release by the party to whom it pertains after such information is released.

C. NERC Reliability Standards and FERC Smart Grid Policy Encourage Sharing of Operational Data Among Utilities and RTOs/ISOs.

EEI believes that existing NERC reliability standards and programs perform well in facilitating data sharing between owners and operators of the transmission grid and allow sensors and grid automation devices the opportunity to achieve their potential to increase grid reliability and performance.

FERC, in its Smart Grid Policy Statement, identified several areas deserving of high priority in the Smart Grid interoperability standards development process, including "cross-cutting issues" (cyber security and physical security to protect equipment that can provide access to Smart Grid operations and a common information framework), and four key grid functionalities ("wide-area situational awareness," DR, energy storage, and electric transportation).[26]

In its Smart Grid Policy Statement, FERC placed great emphasis on "wide-area situational awareness"[27] as key priority for the development of the Smart Grid.[28] FERC recognized that the implementation of wide-area situational awareness could help mitigate the effect of reliability events by giving reliability entities an improved and manageable high-level view of system conditions and parameters.[29] Increased situational awareness could allow for additional system automation and quicker reaction times to various reliability events.[30] Furthermore, FERC identified increased deployment of advanced sensors like PMUs as a tool to give bulk-power system operators access to large volumes of high-quality information about the actual state of the electric system. This functionality could help the Smart Grid address

[26] *See* FERC, Smart Grid Policy Statement, 128 FERC ¶ 61,060 at P 5 ("Smart Grid Policy Statement").

[27] "Wide-area situational awareness" is the visual display of interconnection-wide conditions in near real-time at the reliability coordinator level and above.

[28] Smart Grid Policy Statement at P 55.

[29] *Id*.

[30] *Id*., P 61.

transmission congestion and system optimization. FERC recognized the efforts undertaken by the North American SynchroPhasor Initiative[31] and encouraged RTOs/ISOs to take a leadership role in coordinating such work with the member transmission owners.[32]

In view of existing reliability standards, FERC's Smart Grid Policy Statement, and other existing State-level requirements for electric utilities, EEI does not believe it is necessary to revisit reliability policies in order to facilitate data sharing, however, there is a need for better protocols for electric utilities and RTOs/ISOs with respect to risk mitigation measures resulting from data sharing between these entities.

D. A Public/Private Partnership Data Sharing Model is Necessary to Improve Grid Reliability and Performance.

Protecting the grid from cyber attacks requires a coordinated effort among electric companies, the federal government, and the suppliers of critical electric grid systems and components. Utilities work closely with the NERC and federal agencies to enhance the cyber security of the bulk power system. This includes coordination with DOE, FERC, and the Department of Homeland Security ("DHS"), as well as receiving assistance from federal intelligence and law enforcement agencies.

To complement its cyber security efforts and to address rapidly changing intelligence on evolving threats, utilities encourage federal authorities to embrace a more cooperative relationship to protect against situations that threaten national security or public welfare, and to prioritize the assets that need enhanced security. A well-practiced, public-private partnership utilizes all stakeholders' expertise, including the government's ability to provide clear direction

[31] The North American SynchroPhasor Initiative is designed to improve power system reliability and visibility through wide-area measurement and control. *See* North American SynchroPhasor Initiative, http://www.naspi.org/.

[32] Smart Grid Policy Statement at P 56.

and assess threats, while owners and operators of the critical infrastructure propose mitigation strategies that will avoid significant adverse consequences to utility operations or assets. At the same time, a constructive regulatory environment will assure that incremental investments to protect the grid are prudent, and reduce risk in a manner proportional to the cost.

As Smart Grid technology, such as sensors and grid automation, is deployed within the electric industry, owners and operators of transmission and distribution systems will need timely and actionable information about emergent risks, threats and vulnerabilities. To complement its cyber security efforts and to address rapidly changing intelligence on evolving threats, the industry embraces a cooperative relationship with federal authorities to protect against situations that threaten national security or public welfare, and to prioritize the assets that need enhanced security.

E. Role of Federal, State and Local Governments

Federally sponsored activities to develop interoperability standards and cyber security guidelines should recognize the need to operate legacy equipment for the short and intermediate term while new equipment and technologies are being designed and developed. Such standards should recognize the significant diversity of technologies that are currently present within the electric sector, and not drive toward force-fit or one size fits all solutions that may unnecessarily increase costs associated with deployment while reducing reliability. The diversity of technologies and tools can be driven by a number of different attributes including:

- **Grid characteristics:** Whether overhead or underground, radial or network; grid design and asset composition (*i.e.*, type of equipment, age and condition of equipment, and use of equipment).

- **Service territory characteristics:** Differences in population density (urban, suburban, rural), building stock (single family, multi-family, high-rise commercial and residential, industrial) and topography will determine which solutions are most appropriate.

- **Economic characteristics:** The nature of key customer businesses (e.g., commercial (including, for example, real estate and financial services), industrial, agricultural) and their service reliability needs, as well as the electrical requirements of public infrastructure systems, such as transportation and water delivery, will drive aspects of implementation.

- **Geography, climate, and naturally-occurring hazards** (e.g., hurricanes, ice storms, wild fire, earthquakes, floods).

Additionally, creative solutions are needed to speed the development of ANSI-accredited standards. If the Internet is any guide, the technologies of the Smart Grid are likely to evolve faster than interoperability standards, or public policy. De facto industry standards and protocols that are essential to the implementation of the Smart Grid must become ANSI-accredited standards, or be validated by other processes that are open and include equal representation of all impacted stakeholders.

Regarding the continued development of interoperability standards that incorporate and support cyber security controls, such standards are essential to protect system reliability. Cyber security standards should reflect the scope of potential impacts from failure or compromise, not just the specific interface or function involved. Federally-sponsored activities to develop interoperability standards and cyber security guidelines should recognize the need to provide appropriate levels of security based on the potential impact of failure or compromise rather than simply a given interface label or function. Specifically, there should be a risk-graded approach to security guidelines that recognizes the need to protect the bulk power system and long-lead time equipment, at a more robust level than delivery of energy to a specific customer. Recognizing that there are a variety of interdependencies, and potential consequences associated with the loss of different facilities, the utility industry supports a risk-based, prioritized approach that identifies assets truly critical to the reliable operation of the electric grid. This ensures the most important elements of our system receive the highest level of attention, as well as the resources necessary to secure them.

Interoperability standards and cyber security guidelines need to be flexible and able to be applied within the context of multiple layers of alternative solutions and mitigating controls that include policy and procedural controls, physical security controls, and cyber security controls. There are no “Silver Bullet” cyber security solutions that are appropriate and effective in every deployment. Federally sponsored activities to develop interoperability standards and cyber security guidelines should be concerned with establishing the details of specific interactions and protocols, and should not wander into areas of advocacy or public policy that would favor certain technologies or vendors over others. When advocacy or public policies become incorporated into standards, confusion and challenges result, particularly on those matters that are regulated at a state level.

The Federal government can assist through the development of additional Smart Grid technology testing centers. The Federal government has the ability to perform advanced cyber security research that no single utility would be able to sustain. The lessons learned through forward looking research and testing of current products will allow the industry to avoid known vulnerabilities or deficiencies of Smart Grid products.   There is significant opportunity for federally sponsored testing and certification regimes that will provide unbiased information concerning the performance of various vendor products in certain configurations. Moreover, this clearing house could be used by utility owners and operators to implement vendor specific threat mitigation technology, to reduce the overall risk associated with certain products. Federally sponsored testing and certification regimes can also be used to help purchasers of Smart Grid technology understand and mitigate supply chain risk associated with specific products.

Federally sponsored cyber security threat analysis and risk mitigation centers should have sustained funding and support to avoid a situation where cyber security or threat information is withheld from utility owners and operators who are unable to pay for premium services. The Federal regulatory framework and roles for all stakeholders involved in securing the electric grid should be clear to avoid duplicative or conflicting actions in times of crisis. The electric utility industry is not in the law enforcement or intelligence gathering business, and the government has limited experience operating the electric grid. Thus, each should be consulted, and the flow of information should be regularly exercised, before a threat becomes a crisis. It is critical that the federal government and industry communicate with each other seamlessly; to avoid confusion, those at the highest levels of government and industry should be involved in coordinating responses and declaring the need for emergency action.

To improve electric system reliability and performance, public policy must encourage the availability and affordability of utility-grade communications infrastructure for electric utilities. In addition, state governments should continue to apply or utilize prudent rate making principles, particularly those principles that recognize that there are costs associated with maintaining effective cyber security of Smart Grid components. Finally, EEI wishes to emphasize that effective cyber security requires ongoing investment and vigilance.

VII. MANAGING TRANSITIONS AND OVERALL QUESTIONS

A. Transition to the Smart Grid Requires an Advanced Plan that Appropriately Balances a Variety of Both Short and Long-Term Objectives.

EEI members are actively engaged in developing potential Smart Grid scenarios to establish a long-term vision of the Smart Grid and to identify best methods to transition to the Smart Grid. The goal of these efforts is to develop a Smart Grid technology game plan that appropriately balances state and federal policy objectives, customer needs, business objectives, and the adoption of new Smart Grid technologies. Key aspects of any Smart Grid roadmap should include careful and customer-focused technology planning, internal and external alignment of resources, disciplined processes for technology evaluation, and an open standards-based approach to technology innovation.

Scenario planning is a key part of this process. The goal in developing possible scenarios is not to identify the most likely future scenarios but to examine how external drivers and uncertainties (*i.e.*, economic growth and public policy initiatives) may shape Smart Grid deployment through 2020 and beyond. The characteristics of the resulting scenarios are used to prioritize and select Smart Grid technology projects. Opportunities that appear to be relevant and viable across multiple future scenarios receive additional consideration. For each future scenario, it is important to develop specific proactive responses based on the implications of that scenario.

A key aspect of any successful transition by a utility is to ensure customer acceptance. To this end, transition roadmaps should include customer engagement programs that address, among other things, the value of impending changes to prepare customers to understand new products and services. In the case of smart meters, one of the lessons learned is that a comprehensive and proactive customer outreach plan that reaches customers through a variety of channels (e.g., TV, radio, Internet, demonstrations at community events, door hangers, bill inserts, etc.) prior to and during the deployment of their new advanced meters can ease the transition. Engagement of customers must be on-going, through every phase of the transition. As the American Recovery and Reinvestment Act-funded Smart Grid Investment Grant and Regional Demonstration projects progress over the next several years, it will be important to capture lessons learned and identify best practices that can be broadly shared. EEI members support the Department's effort to capture the benefits of these projects and to make the results available through the Department's Smart Grid Information Clearinghouse.

B. A Phased Approach to Smart Grid Implementation that Ensures Harmonization Between Existing and Future Interoperability Standards and Minimizes the Potential for Obsolete Equipment Should Provide a more Consistent advancement of the Electric Grid into a Modern, Forward-Looking System for All Participants.

EEI encourages increased collaboration between the electric utility industry, technology companies, consumer advocates, and government stakeholders to develop options for integrating Smart Grid technologies and systems with legacy technologies and systems, and supports the continued development of interoperability standards and cyber security requirements through the NIST process. It is essential that standards ensure that new equipment meets cyber security requirements, is interoperable with other new devices, is compatible with legacy systems and will be compatible with future equipment.

The NIST report on Smart Grid Cyber Security Strategy and Requirements[33] represents a good step forward in identifying issues, challenges and potential solutions toward Smart Grid interoperability and cyber security. If given sufficient time to be properly developed and implemented, through a working and effective Smart Grid Interoperability Panel ("SGIP")and Smart Grid Interoperability Panel Governing Board ("SGIPGB"), then the NISTIR 7628 can be helpful to the electric industry's efforts to develop a safe and secure Smart Grid.[34] It is important to recognize that each electric utility has very specific and potentially unique implementation and deployment requirements. While it is clear that Smart Grid products of the future must have appropriate security "built-in" as part of design, nevertheless, one-size-fits-all solutions are not appropriate.

It is essential to ensure harmonization between standards in use today and those being developed for the future. For example, the substation communications standard IEC 61850 should be harmonized with the DNP3 standard which also covers substation communications. The PAP 12 process supported by NIST is a positive example of a process to harmonize new standards with existing ones.

A growing area of concern for electric utilities is the potential for technological obsolescence. In contrast to traditional utility investments that have long, stable asset lives, smart technologies are anticipated to evolve rapidly over the coming years. The Smart Grid technology itself may have a substantially shorter life-cycle than the equipment it replaced. Further analysis will be needed to better understand the potential impacts of replacing an

---

[33] *See* NIST Report on Smart Grid Cyber Security Strategy and Requirements (February 2010) ("NISTIR 7628").

[34] *See* EEI Comments on Draft NISTIR 7628 (filed December 1, 2009).

increasing amount of grid assets (which may have asset lives of several decades) with Smart Grid technologies that have asset lives of perhaps a single decade.

Given the rapid rate of technological change that is occurring, depreciation rates may need to be adjusted to reflect the relatively short economic lives of some Smart Grid assets. State and federal regulators need to consider adopting policies that limit the impact on utilities of prudent investments in assets that subsequently become underutilized or obsolete.

C. Multiple Utility Business Models are Likely to Exist in the Future Depending on Regional Market Structure.

To examine the challenges associated with Smart Grid implementation and discuss how Smart Grid technologies could change the business model for electric utilities, EEI held two workshops in June 2010 that brought together 50 industry smart technology leaders (vendors, academics, regulators, consumer advocates, Wall Street analysts, private business and technology consultants, utility management).

The objective of the EEI workshops was to determine from a stakeholder perspective, the impact that the deployment of smart technology might have on the structure of the industry, the business opportunities/obstacles that may arise, and the regulatory and implementation challenges that will emerge. Four scenarios with varying levels of economic growth and public policy initiatives were examined. The scenarios were created following a careful analysis of the critical driving forces affecting the Smart Grid, and after making some assumptions as to the degree of impact (positive or negative) that these forces might have on the pace of technology development and adoption.

Takeaways from the workshops include:[35]

- Smart Grid technologies and applications will transform the utility industry.
- There are new electric industry market entrants involved with Smart Grid technologies and applications.
- Advances in information technology are creating a new customer culture and new customer expectations.
- There will be an increasing percentage of customers who will be zero net energy customers, have microgrids, etc.

The workshop participants believe that multiple utility business models are likely to exist in the future depending on regional market structure, including:

- Traditional vertically integrated utilities
- Commodity plus energy services provider behind the meter
- Wires companies
- Alternative generation supplier (distributed generation, wind, solar, etc)
- Utility/vendor partnerships—comprehensive energy packages with vendors focusing on the customer side of the meter.
- Trusted energy advisor model—utility functions as "trusted energy advisor" for providing the customer with information on behind the meter energy services providers.

Because the Smart Grid will be developed and deployed over a long period of time, periodic monitoring of the scenarios will help to understand if adjustments in the Smart Grid vision, strategy or development timing are required.

D. Delaying Investment in Smart Grid Infrastructure Could Have Unintended Consequences.

Delaying investment in Smart Grid infrastructure may have several unintended consequences. Investments may become obsolete faster than expected. Some new products or technologies may require accelerated Smart Grid deployment in order to leverage superior

[35] The themes presented here represent a summary and synthesis of the major discussions and takeaways from the workshops. As such, they represent the consolidated opinions of the workshop participants and not necessarily the views of EEI or any of the individual participants or their companies.

technology and lower deployment costs. Delays could result in postponement of operational benefits, such as line loss reduction and situational awareness systems that could help the utilities reduce or prevent outages. In addition, this could also lead to delays in indirect customer benefits from new product solutions such as customized information, remote energy control, and in-home information systems. Delaying Smart Grid infrastructure investments might result in deferral of new economic development opportunities for new Smart Grid and energy-efficiency-related businesses. Moreover, the unintended consequence of diminishing U.S. leadership on Smart Grid is a distinct possibility.

Again, it is important to recognize, however, that there are differences in customer types among and within customer classes and by region. Each utility has a unique service territory with varying geographic, economic, and cultural characteristics. Targeted demonstration projects may be needed to identify the benefits for each customer segment and what is needed to achieve those benefits. Smart Grid technologies should be rolled out first where immediate benefits are realizable. As NARUC indicated in their Resolution Regarding Smart Grid, "Smart [G]rid policies and standards should balance the costs of the Smart Grid with the benefits of the Smart Grid and the costs and benefits should be quantified to the extent possible."[36]

E. Challenges to Smart Grid Implementation Should be Addressed in a Collaborative Process Involving all Major Stakeholder Groups.

There is widespread consensus that the communications, control and security aspects of the U.S. distribution and transmission system need to be modernized and upgraded, and additional transmission infrastructure needs to be constructed, in order to continue to ensure reliable and secure electricity service. Increasingly, however, regulatory commissions and

[36] NARUC Resolution Regarding Smart Grid (July 22, 2009), available at http://www.naruc.org/Resolutions/Resolution%20on%20Smart%20Grid.pdf.

various consumer groups are assessing the value to the customer of proposed Smart Grid investments, expressing concerns over the costs and benefits of smart meters and dynamic pricing including costs in danger of being stranded, unrealized customer benefits, potential pricing proposals that may be harmful to some customers, and the potential for increased disconnections.

As demonstrated recently in Maryland, regulatory commissions are concerned over the potential rate impacts of approving Smart Grid investments and are struggling to determine the most appropriate mechanism for cost recovery and how the cost of Smart Grid investments should be allocated among and within different customer classes.

In addition to ensuring that electric utilities are able to recover the costs of prudent investments, maintaining U.S. global competitiveness in Smart Grid technologies will require that electric utilities have access to additional dedicated spectrum for critical operational needs.[37] Utilities need the flexibility to utilize the communications networks and technologies that provide their customers with the appropriate level and quality of service, which is economically priced and provides the appropriate level of access, security, reliability and privacy.

Given the complexity of these challenges, EEI believes that the most efficient path to addressing these challenges is to initiate a collaborative process that would encompass all major stakeholder groups including regulators (state and federal) and the Administration. A few venues where collaboration is occurring include the ongoing work by EEI to engage industry stakeholders in dialogue to address Smart Grid implementation issues, the FERC/NARUC Smart Grid Collaborative, the current regional transmission planning process, and the DOE's Smart Grid Information Clearinghouse.

[37] *See* Comments of EEI, DOE NBP RFI: Communications Requirements (filed July 12, 2010).

The collaborative process should focus on development of best practices for the resolution of various policy, regulatory and implementation issues that are arising as smart technology is being deployed.

F. Federally Funded Research and Development Can Support Smart Grid Deployment.

As mentioned earlier in these comments, additional research is needed to develop cost-effective energy storage technologies. In addition, tools are needed that model customer charging behavior and impacts to the electric grid. Given that electricity is a just-in-time commodity, utilities need tools that enable them to predict load at a granular level. For example, a reservation system is needed that could potentially be built into cars and other devices to stagger charging in order to avoid overloading the distribution system. Other areas where research and development is needed include applications and uses of phasors on the transmission system and further research into practical ways to increase security of the electric grid.

CONCLUSION

EEI respectfully requests that the Department consider these comments and ensure that any DOE recommendations regarding the wide range of Smart Grid issues that are the subject of this request for information are consistent with them.

Respectfully submitted,

EDISON ELECTRIC INSTITUTE

*/s/ David K. Owens*______

H. Russell Frisby, Jr.
Jonathan P. Trotta
Counsel
STINSON MORRISON HECKER LLP
1150 18th Street, NW, Suite 800
Washington, D.C. 20036-3816
(202) 785-9100
(202) 785-9163 (Fax)
rfrisby@stinson.com
jtrotta@stinson.com

David K. Owens
Executive Vice President

Aryeh B. Fishman
Director, Regulatory Legal Affairs
Office of the General Counsel

Edison Electric Institute
701 Pennsylvania Avenue, NW
Washington, DC 20004-2696
(202) 508-5000
afishman@eei.org

Dated: November 1, 2010