National Grid's Response to the Department of Energy Smart Grid RFI: Addressing Policy and Logistical Challenges of Smart Grid Implementation

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National Grid's Response to the Department of Energy Request For Information on Smart Grid

Key Policy questions that must be answered

Pursuant to the Request for Information entitled "Addressing Policy and Logistical Challenges to Smart Grid Implementation," issued by the Department of Energy ("DOE") Office of Electricity Delivery and Energy Reliability (published September 17, 2010), National Grid hereby submits these comments on the continued development and implementation of Smart Grid. National Grid commends the DOE's leadership in promoting Smart Grid technologies, and appreciates the opportunity to provide the DOE with its perspectives on the existing and future challenges to the success of Smart Grid.

Today's centralized energy network has not fundamentally changed since its creation at the dawn of the 20th century. While there have been continual advances, the electric industry has not undergone the digital transformation that characterizes many industries, and the grid remains largely a one-way system of providing electricity to businesses and households on demand. Customers seem to have a never ending appetite for electricity, and demand has risen over 400% since the 1940s. Efforts continue in the United States to expand the efficient use of energy, but more can be done.

The reality is that new transmission lines are very hard to site, fossil fuels are at risk, and the grid is aging well beyond its design life. Improvements in the efficiency of production, transmission, delivery and use of energy are cornerstones of the future because the most effective way to reduce environmental consequences and to keep electric costs low is to use energy efficiently. All of this leads us to conclude that the current path is unsustainable. Innovation that can transform the electric grid into a continually efficient engine of the economy should be pursued.

There are various aspects of the "Smart Grid," however, that should be considered (or re-considered) as we contemplate opportunities to jump start the economy and ensure that the energy infrastructure is capable of meeting the needs of a 21st century economy in the United States. While not exhaustive, this paper will address the critical areas requiring innovative solutions. National Grid believes that innovation will deliver greater efficiency in provision of electricity as these key elements are addressed:

Development through appropriate funding of the "Smart Energy" ecosystem;

New models for innovation;

Creation of a DOE Smart Energy Commission;

Evolution of energy efficiency;

Development of ubiquitous broadband communications; and

Development and implementation of common standards for security and interoperability.

The "Smart Energy" Ecosystem

The "Smart Energy" ecosystem is a broader concept than the "Smart Grid" as it has been defined throughout the industry in the United States. Today, we speak of "Smart Grid" as an evolution to modernize electric service. However, the Smart Energy ecosystem would optimize the utilization of a resource: energy. Indeed, many utilities in the United States operate the electric and gas infrastructures within their service territories and some even operate water, communications and/or steam systems. The thought leaders and policy makers in the energy sector should recognize that modernizing infrastructure, especially as it relates to its utilization, monitoring and operation, is much broader than just the electric sector.

Moreover, in most of the major cities in the United States, energy utilization is significantly intertwined with the many layers of infrastructure within those cities. The modernization and development of the electric grid in isolation and its independent development will not capitalize on the opportunities that would otherwise be realized through a holistic approach that considers modernization opportunities for all energy and critical infrastructure. This is consistent with the objectives set forth in the Energy Independence and Security Act which focused on, inter alia, energy security. Furthermore, as we consider the marketplace and the advancement of technologies, the Smart Energy ecosystem will accelerate the development and deployment of those technologies that can and will positively contribute to the economy's success.

While, for clarity, this paper will reference issues associated with electric smart grids, the concepts expressed can be equally applied to all energy delivery systems that will make up a smart energy ecosystem.

National Grid recommends that policy be developed to govern and fund smart energy ecosystems.

New models for utility innovation are needed

Utility innovation is at the core of successful deployment of Smart Grid technology. Smart Grid will not be successful without the active engagement and experimentation on the part of utilities. Over the past several decades, utilities have increasingly moved away from innovation. For example, utility investment in Research and Development ("R&D") has dropped dramatically over the past two decades as utility customers remain singularly focused on the cost of energy and efforts to recover R&D funding from customers of any particular utility can be stymied over concerns with customer bill impacts. EEI's *Electric Perspectives* magazine had an article discussing R&D spending as a percentage of sales in its September/October 2010 issue. Not surprisingly, utilities had the lowest percentage at about 1% as compared to Pharmaceuticals at about 18%, Aerospace and Defense at about 12%, Computer and Electronics at about 7% and Automotive at about 3%. Some portion of the budgets for Aerospace and Defense, Computer and Electronics and Automotive is devoted to the development of equipment or processes associated with smart grids.

The US federal government has improved this performance. The Smart Grid Deployment and Demonstration programs funded through the ARRA were an important, initial opportunity for innovation that energized the industry and its regulators. The federal government should consider building on the success of the ARRA model to take the next step in evolving US energy systems.

The ARRA funding encouraged utilities to invest in smart grid and their public utility commissions to approve cost recovery for such investment through incentives in the form of matching grants. Utilities and their commissions worked within the regulatory processes in each state to rethink and reinvest in utility innovation. Their effort resulted in an outpouring of proposals for the federal government to consider for grant-making. The federal government should not lose this momentum.

The ARRA grants also promoted the improved competitiveness of the United States economy through the creation of jobs in emerging industries and the promise of a more efficient electricity industry from generator to customer. National Grid recommends that DOE continue to provide grants until the nascent industries (e.g., Smart Grid, smart appliances, renewables, etc.) are fully capable of providing commercially cost-effective products. DOE funding of Smart Grid will improve the benefits to customers from these systems and assist regulatory recovery of matching funds by utilities. Smart Energy ecosystem technology will prove itself over decades in ways that are unforeseen today, much like the cell phone and the internet have significantly changed over the last decade. National Grid expects the Smart Grid will evolve to do more in the future than envisioned today. The nation can hasten this day and its value with a full commitment to advance these industries. Without this commitment, the Smart Grid roll-out may stall after the ARRA grants are used up, hampering job creation as equipment would not need to be produced with capabilities to communicate with a Smart Grid..

An ongoing DOE program that provides 50% funding for utility Smart Grid innovations, and requires 50% matching funds from utilities with the support of state regulators would form a new and unique partnership among states, the federal government, and the utility industry. This investment could be managed by a new DOE commission (discussed below).

New models for collaboration and information sharing are also needed. Smart Grid is now a global technology development effort. At the same time, Smart Grid deployments and the responsible utilities are inherently local. The federal government should consider how best to foster international, national, and regional collaboratives to share information and key lessons learned. Many of these collaboratives already exist and we encourage federal government to use these networks, for example the International Smart Grid Network (ISGN) and the Global Smart Grid Federation (GSGF).

The ARRA funding of Smart Grid demonstrations will likely progress Smart Grid technology over the next several years. However, despite this progress, there will still be many unanswered questions on Smart Grid technology. Furthermore, Smart Grid systems will evolve with experience and future improvements in technology may not come to fruition without support from the government.

The support for innovation in the utility industry is urgently needed to build the Smart Grid platform. While experimentation and R&D will continue to be important, greater emphasis should be placed on deployment of technology that will be available in the near term. The Department of Energy's FY11 Budget Request to Congress does not currently reflect this urgency. The budget requested for DOE's Office of Electricity Delivery and Energy Reliability (DOE-OE) is $186 m, which represents less than 0.7% of the entire Department of Energy budget request.

There are opportunities within the DOE-OE's budget to support a new model for innovation. This new model for utility innovation should be both collaborative and competitive in nature. Collaboration is required to ensure limited funding is well-spent and results are broadly disseminated. Competition for funds also creates better, more thoughtful projects with greater commitment from participants. Congressionally-directed projects and legacy programs can be counter-productive to rapid Smart Grid deployment and waste tax payer funds. Deployment of Smart Grid cannot happen without the active engagement of utilities. The overwhelming response from the utility industry to the Smart Grid stimulus

program is a clear sign that the industry is very interested in working with DOE. Any DOE program on Smart Grid should require active participation from the utility industry.

National Grid recommends greater federal funding for Smart Grid investments that will accelerate deployment of the Smart Grid platform. DOE should reprioritize its current programs and create a new sustainable innovation model to support smart energy projects, awarded on a competitive basis. This program should be targeted to utilities and require a 50% match from utilities with the support and approval of state regulatory commissions.

Smart Energy Commission

In conjunction with the recommendation to continue funding, National Grid recommends transforming the Smart Grid Task Force into a Smart Energy Commission under DOE oversight. The Commission would oversee selection and implementation of Smart Grid projects that receive a 50% matching grant. The Commission could work with State Commissions to review progress of funded Smart Grid activities in the respective States. If funding of Smart Grid programs continues, the matching grant provides an independent assessment to regulatory commissions that the investment is appropriate, while lowering total overall cost to customers of the utility receiving the grant. Regulatory commissions should remain diligent in review of any proposals before them for approval. However, the ability to receive matching funds from a vigilant oversight Commission should overcome many concerns and maintain the momentum created by the initial ARRA grants.

The DOE Smart Energy Commission would be authorized to approve funding for projects which utilize innovative technology and improve service to customers throughout the United States. Also, the Commission could ensure that the benefits of Smart Grid technology reach to every corner of the United States. In many ways, this structure could be similar to successful energy efficiency programs over the last two decades: grants are provided to technology deemed to be the latest improvements but are not yet accepted by the marketplace. This will help establish the incentive and benefits analysis necessary to ensure the continued modernization of the energy system in a consistent and standardized manner.

Furthermore, the DOE Smart Energy Commission could identify those investments that would be considered foundational and so ensure that the utilities undertaking those investments receive matching funds through the grant program. The clarity and certainty with respect to the federal commitment to smart technology investment evidenced through the creation of the Smart Energy Commission would also provide equipment manufacturers, software providers and utilities the ability to hire additional personnel and dedicate the time and investment necessary to train them for long-term investment strategies. Also, customers could plan their own investments with the full understanding that the nation supports this effort over the long term.

National Grid recommends the DOE form a Smart Energy Commission to manage the ongoing matching grant program for Smart Energy projects.

Energy Efficiency

The linkage between smart grid technologies and greater efficiency in energy products cannot be overestimated. Many of the savings or benefits attributed to Smart Grid are from more precise control over equipment. The greater precision allows customers to use energy when it is less expensive or not at all. Smart energy technologies inform customers about the consumption and the cost in almost real-time. For example, Building Energy Management Systems (BMS) have long been a principal component of commercial and industrial building efficiency measures. Efficient lighting and HVAC systems are controlled by the BMS and are an integral part of the overall savings attributed to these projects. However, these systems operate to minimize customers' bills in a static fixed rate environment. Bringing this level of control technology and near real-time pricing to customers large and small, residential or commercial/industrial, enhances the value of these efficiency measures.

The deployment of dollars into smarter energy systems will create two opportunities. First, it would lead to the development and resulting cost reductions in end-use technologies including energy efficiency, smart appliances, electric vehicles, renewable energy, and energy storage. Second, funding smarter energy systems will improve the efficient operation of the grid through improved management of customers' demand and improved knowledge for operating and planning the electric grid.

The problem facing the Smart Grid installation is the issue of "which comes first." Appliances today are not designed to interact with a Smart Grid. Special controllers are provided to participants in Smart Grid pilots that control in real-time and have communicating capability. Although they have come down in price from 10 years ago, the controllers remain expensive for customers given the limited demand for them. Plus, they work primarily on air conditioning systems as opposed to other parts of the household such as refrigeration, water heating, pool pumps, etc. Thus, it is difficult to justify Smart Grid buildouts when the amount of real-time control is limited for many customers.

The DOE can activate further progress in efficiency through the establishment of standards for manufacturers to meet over time. National Grid recommends the DOE work with manufacturers of appliance and commercial/industrial equipment to set energy efficiency and interoperability standards, and timelines to meet these standards. The standards will perform two important functions. First, National Grid recommends the standards set greater requirements for the efficiency of electrical products over an achievable timeline. Second, National Grid recommends the standards require the manufacturer of products to include addressable devices ("smart chips") in the operation of the product. These addressable devices should be designed to communicate with home networks and utility systems. By setting these standards, the government will eliminate the "which comes first" dilemma facing the industry. With these standards, the government will encourage manufacturers to find ways to efficiently build these products within a reasonable timeframe. This will lower the average installation cost to the minimum possible if all manufacturers were installing these devices in their products.

Why are these standards important? With a growing market saturation of smart chip-equipped devices, utilities will be increasingly able to manage the supply of energy to customers by balancing supply and demand without requiring direct customer involvement.

The relationship of peak demand use to average demand use defines the efficient operation of a utility grid. A lower ratio of average to peak demand indicates the amount of capacity built to deliver the demand is not being utilized efficiently and more capacity is required to serve customers with growth in average demand at the same "load factor." Thus, costs are higher for customers. If peak demand can be lowered through management, the operation of the system becomes more efficient and, over time, less capacity is necessary to serve customers.

The ability to reduce peak demand consumption depends on control of demand. However, utilities have always accepted the diversity of customer loads and designed the system assuming no control of customer demand, except in those instances where certain items, such as pool pumps and water heaters, were controlled. These controllers operated independently with all customers being shut-off at once and for a few hours in length until the peak passed. Smart Grid provides an opportunity to broaden the choice of technologies to control by providing flexibility to maintain the services requested by customers: e.g. air conditioning or refrigeration. However, the industry will not realize this opportunity without the creation of an overarching interoperability technology that interacts seamlessly with all elements of Smart Grid.

Smart Grid and its associated interoperability capabilities will also work at a larger customer level, facilitating the connection of renewable energy sources and, through integration with Regional System Operators, enabling the management of the load / generation balance on the overall grid.

During the late 1990s, a large chain of grocery stores realized that they could manage their energy costs by controlling their refrigeration systems within and across all of their stores in a region. Thus, they could run 25% or 50% of their refrigeration units at any point in time while shutting down all other refrigeration units. The chain was able to perform this control with minimal loss of cooling for their products. This effort saved the chain by reducing their direct store costs for energy and reducing their energy costs across stores by commingling their capability to respond to demand response events called by the regional system operator. Control technologies in appliances such as refrigeration and HVAC coupled with Smart Grid technology and communications provide the opportunity to similarly manage demand use across millions of customers who are unaffiliated. Customers' cooling equipment could be run to maintain temperature in the home or refrigeration unit within an agreed range. Since cooling equipment cycles based upon temperature changes anyway, a remote manager of the refrigeration units could cycle the units in a manner to maintain service levels within the desired range, but lowering overall total demand from all of the refrigeration units. If this control were available, the production, transmission and delivery of energy could be made significantly more efficient. At the same time, customers would receive the service that they requested. However, the attainment of this vision requires a decision as to which comes first: smart appliances or Smart Grid infrastructure

National Grid recommends that the DOE mandate smart chips, conforming to standards of interoperability (discussed below), in every electronic/energy using device sold including all appliances, hot water heaters, air conditioners, etc. Taking this crucial step will mean that gradually over an extended period of time greater amounts of energy equipment would be controllable without impacting customer's lives.

National Grid recommends that standards be put in place soon to require all devices manufactured to have smart chips.

Ubiquitous Broadband Communications

The nationwide deployment of Smart Grid technologies is dependent upon the availability of reliable broadband technologies (wired or wireless) that will facilitate the communication infrastructure necessary to link the integrated end-to-end systems of Smart Grid. There are many details and complexities associated with the implementation of Smart Grid technologies that will transmit a tremendous amount of information instantaneously. The existence of a ubiquitous broadband technology platform capable of being utilized by the numerous energy providers and critical infrastructure owners throughout the United States would socialize the cost and justify its development.

Although the nationwide strategy and deployment of Smart Energy Ecosystems are in their infancy, it is already apparent that the underlying application of Smart concepts is dependent upon the availability of a reliable and secure broadband communication platform. Today, however, while electricity is available throughout the United States, broadband communications is not. Consequently, in order to meet certain communications needs, especially in some rural areas throughout the country, energy utilities have developed various solutions to facilitate necessary communication and interaction with energy infrastructure. Although the execution of these various strategies meets the needs of the utilities and its customers, this uncoordinated approach will not yield the results necessary to realize the potential of Smart Grid technologies as they are deployed nationwide. In fact, the lack of ubiquitous broadband is hindering the deployment of Smart Grid technologies because energy providers cannot justify the investment necessary to establish a communication platform upon which to use the Smart Grid technology.

Moreover, the vision of Smart Grid articulated by the Department of Energy, the Federal Energy Regulatory Commission, Congress and numerous State Legislatures cannot be realized if each energy provider is required to develop and execute independent communication strategies. Today, as we begin to develop the energy grid of the future, we have an opportunity to develop a comprehensive broadband communication strategy which will encourage and establish consistency, efficiency and effective deployment of a nationwide Smart Grid. This comprehensive strategy becomes even more important as we consider that utility requirements vary significantly and Smart Grid applications are rapidly being developed. Finally, as we continue on this path, it is clear that the expansiveness of smart technologies will continue to evolve and include applications that today we have not even contemplated.

Similarly, as we have learned through natural disasters experienced throughout the nation over the last decade, in order to effectively operate critical energy infrastructure to meet the recovery needs of those affected, communication networks must be designed to prioritize the transmission of necessary infrastructure data. Accordingly, the broadband communication strategy necessary to execute the envisioned Smart Grid will need to anticipate and be able to adapt to the needs of our customers in order to contribute to meeting national energy and environmental objectives.

Today, we are on a journey that will inextricably link these two technologies together and change the way we think about and use our resources. As energy utilities actively pursue the deployment of Smart Grid technologies, we are committed and encouraged to work collaboratively with the various stakeholders to ensure that the envisioned benefits are realized by customers nationwide. While the desires and ambitions of the various stakeholders throughout the United States continue to evolve and coalesce regarding the vast capabilities promised by the evolution of a smarter grid, the FCC and DOE are uniquely positioned to develop a comprehensive broadband plan that will lead this nation.

National Grid asks DOE to support the FCC's mandate to achieve ubiquitous broadband across the US.

Standards are necessary

In 2007, Congress established "smart grid" development as a national policy goal and directed the identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services. It also instructed each state to consider requiring electric utilities to contemplate smart grid solutions when planning grid modernization, and to consider allowing cost recovery of smart grid investments.

Congress also recognized that a focused national approach would be needed to achieve interoperability -- the ability of all smart components to communicate and interact seamlessly. With myriad devices, manufacturers, systems and applications, uniform national standards and protocols are essential. Responsibility for coordination of the standard-setting process was assigned by Congress to the National Institute of Standards and Technology (NIST). NIST initiated the Smart Grid Interoperability Panel (SGIP), a public-private partnership that has taken on this enormously complex multi-year project, and has developed and is executing seventeen specific Priority Action Plans (PAPs) to address specific standards issues to be resolved. In addition, more than seventy specific standards have been identified for analysis as to how they should be applied to various aspects of electric power infrastructure.

It is crucial these standards be formally adopted and that work continues to create more standards as technology evolves. Certainly the recent submission of the five foundational technical standards to FERC is a great start.[1]

Standards governing the security, interoperability, and other aspects of the Smart Grid are necessary to proceed effectively with Smart Grid programs. Especially in the early stages of buildout, before many systems and processes become permanent or prohibitively difficult to change, a consistent set of standards will allow a more efficient rollout, more robust security, easier integration of devices into the system, and more certainty for utilities. Customers will also be more amenable to accepting new meters and appliances, sharing usage information, and participating in programs if they know their privacy and security are being guarded and their smart appliances are compatible with all Smart Grid programs. The interconnectedness of the national electric grid and consideration of many different issues lends itself to the federal government, through the appropriate federal agency, developing standards. Much work has already been done to identify standards, and the federal government should use these development processes as a model for the future.

Cyber security must be an overarching element of the Smart Grid. The increase in communications technology will create more access points through which people can infiltrate the power

[1] IEC 60870-6 Telecontrol Application Service Element 2, IEC 61850 Communications Networks and Systems for Power Utility Automation, IEC 61968 Application Integration at Electric Utilities - System Interfaces for Distribution Management, IEC 61970 Energy Management System Application Program Interfaces (EMS-API), IEC 62351: Power Systems Management and Associated Information Exchange - Data and Communications Security

grid and gain access to utility systems and critical assets. While it may not be possible to stop every attack, security standards must ensure that risks are minimized and critical assets remain as safe as possible. Similarly, new threats are continually emerging, so standards must be regularly updated. Working with partners throughout the industry to create secure systems, as has been done with banking ATM systems, and will therefore help to move the debate to securing the human element.

Customers' privacy must also be protected. This is essential to gaining public trust and acceptance of new technologies and services that will be available. Security standards should include requirements to transmit data securely to prevent unauthorized access as well as protocols for sharing customer data with authorized third parties. Federal legislation may be useful on privacy and handling customer energy information.

Interoperability of devices is also critical. Standards must be developed so that devices and systems can communicate and work together even if they are being run by different utilities or in different regions. Technology in the generation, transmission, and distribution levels of the electric grid will have to communicate with each other, and if they are not able to do so it will lead to reliability and service impacts. Individual utilities will ensure their networks are efficient, but RTOs and ISOs must continue to see how their larger network is performing, incorporating any number of utility companies. Likewise, if appliances are not able to communicate with the home area network, customers and utilities will not be able to capitalize on the new technologies that will be introduced which could promote demand response and other programs.

Other standards not yet under development must be taken up by the federal government or adedicated group such as NIST. States or regional entities are likely to focus on the local effect of Smart Grid applications, even though they will have nationwide impacts as devices and systems become more interconnected. The federal government is better positioned to take a broader look at the security, reliability, and interoperability of future activity and assess overall costs and benefits. For example, electric cars are just starting to be released by manufacturers and could have significant load impacts on the electric grid, including needs for infrastructure investments. Customers would also be driving cars across states, meaning charging technologies must be compatible nationwide.

The NIST standards development process is an appropriate model for the federal government to follow. While working on cybersecurity guidelines and interoperability standards, NIST solicited input from hundreds of stakeholders, leading to documents that have been thoroughly reviewed and have taken a wide array of perspectives into account. Other, similar initiatives are underway as well, including the Electric Power Research Institute helping to coordinate cybersecurity measures and prevent duplicative work. NIST is now proposing interoperability standards to FERC for rulemaking, which will ensure compatibility with other regulations and support from the electric industry. Particularly with the Smart Grid, proper standards must be in place from the beginning since they will be difficult to change as new systems are implemented. As noted in the RFI, much of the new equipment will be in use for a decade or more. This emphasizes the need for common sets of standards as soon as possible to get the most out of current investments and avoid obsolescence and inefficient uses of resources. National Grid believes that standards can be used as they are being created, and applauds the work NIST has done and is doing on this necessary task.

National Grid recommends the federal government continue to endorse the work NIST and IEC/IEEE are doing to put standards in place as quickly as possible.

Conclusion

National Grid recommends that the DOE focus on six key areas until the Smart Grid is fully built in the United States:

1. appropriate funding of the "Smart Energy" ecosystem;
2. new models for innovation in the energy industry;
3. creation of a DOE Smart Energy Commission to manage Federal funding for the Smart Energy ecosystem;
4. evolution of standards for energy efficiency measures, including requirements for smart chips;
5. development of ubiquitous broadband communications; and
6. development and implementation of common security and interoperability standards to create a "plug and play environment for the Smart Grid from producer to customer.

Focus on these six areas will transform the energy systems of today into an innovative system for tomorrow.

National Grid commends the federal government for supporting the first tranche of Smart Grid rollout as part of the effort to improve the economy. Continuing to support further rollout through additional budget support, in a manner similar to the ARRA, until a smart grid ecosystem is effectively established will have tangible benefits to the country.

Investment in a Smart Energy ecosystem will improve the efficient management of the country's energy systems. At the same time, this investment will support a nascent industry with world-wide implications: Smart Grid technology. This will create jobs for Americans and spillover benefits across the economy. Manufacturers will increase research and development of new technology and increase production and sales of smart products with greater demand from customers. Improved services in areas such as demand response will see growth in consumer demand for such services and help to ensure system reliability through coordinated interaction with customers. Easing the integration of renewables onto the grid will increase demand for installers and technicians in those industries. An added benefit is that positions such as these need to be at the site of installation and cannot be outsourced abroad.

Early expertise in Smart Grid technology and programs will also position the U.S. as a worldwide leader in Smart Grid services. We will be able to export knowledge on best practices to educate and interact with customers, maximize the benefits of Smart Grid programs and technology, and solve problems that arise. Having a highly-trained and knowledgeable workforce will give American companies an advantage and ensure that other countries look to the United States for technology, systems, advice and support not available elsewhere. This will also have the benefit of creating green jobs.

The DOE Smart Energy Commission has the potential to provide funding for eligible projects and oversee the results ensuring that the rollout is completed in a consistent and efficient manner. Once the smart grid ecosystem is completely established, the Commission can be dissolved as all future system enhancements will automatically incorporate smart grid concepts and technology.

National Grid appreciates the opportunity to make recommendations to shape the implementation of the smart energy ecosystem, and is vitally interested in helping to fully implement this exciting and crucial evolution of energy management that will provide significant, material benefits for customers, the country and the environment.