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US Department of Energy
Office of the General Counsel
1000 Independence Avenue, SW
Room 6A245
Washington, DC 20585

Re: NBP RFI-Addressing Policy and Logistical Challenges to Smart Grid Implementation

OVERVIEW

The Telecommunications Industry Association (TIA) is pleased to provide comments on how to address the numerous challenges facing the development and deployment of smart grid technologies. Smart grid is a more robust application of information and communication technologies (ICT) to transform the generation, transmission, distribution and consumption of electricity to provide greater automation, increase reliability, improve efficiency and reduce energy consumption. ICT also facilitates the integration of intermittent energy generated by solar and wind and electric vehicles into the electric grid.

Electric utilities and the ICT industry share a long tradition of partnering to build and maintain the communications networks contributing to the security and reliability of the grid. While ICT is not new to utilities, the degree of seamless integration between ICT and electric utility infrastructure provided by the smart grid provides unprecedented opportunities for utilities and consumers. Representing the ICT companies that innovate, manufacture and supply the ICT products and services that will make the smart grid a reality, TIA believes modernization of the U.S. electric grid is a vital component of the Nation's energy strategy aiming to reduce US dependence on foreign oil, decrease carbon emissions, create jobs, and help U.S. industry compete successfully in global markets for clean energy technology. The smart grid has the potential to provide the following benefits:

<u>Smart Grid Benefits</u>

1. Reduce energy consumption and carbon emissions through:
   - Empowering consumers with usage and pricing data enabling better end use energy efficiency and conservation through real-time feedback 365 days a year.
   - Reducing peak demand through demand response programs.
   - Reducing line-loss in transmission and distribution.
   - Facilitating the integration of renewable energy sources into the grid.
   - Enabling utilities to manage the addition of electric vehicles to the grid.
2. Create thousands of high value, permanent jobs in the U.S.
3. Position the U.S. to compete in a rapidly growing, multi-billion dollar global market.

There are significant and complex policy, market, and logistical barriers that limit the development of the smart grid. In addressing consumer and technology related obstacles, TIA recommends the following policies to maximize the benefits of the smart grid.

Policy Recommendations:

CONSUMER POLICY RECOMMENDATIONS

- Provide consumers with access to usage, pricing, and carbon mix data in machine readable form for use in 3rd party applications.
- Provide consumers with uniform and consistent privacy policies.
- Coordinate smart grid stakeholders in a sustained consumer awareness & education campaign.
- Provide incentives to assist with the purchase of consumer smart grid devices.

TECHNOLOGY POLICY RECOMMENDATIONS

- Establish appropriate federal-level policies that define common goals and establish a common market for smart grid technologies.
- Technology neutrality across an open smart grid architecture is critical for innovation of smart grid solutions.
- Allow for voluntary standards to support the dynamic nature of ICT innovation and to maximize flexibility and choice in a rapidly changing, market-driven ecosystem.
- Provide additional funding for both R&D and off the shelf smart grid deployments across the span of viable technologies and architectures to evaluate technology effectiveness at scale.
- DOE should coordinate with the FCC to enable greater use of current licensed and unlicensed spectrum by smart grid applications, including the consideration of future growth of smart grid services.
- The FCC should allow utilities to use the local and regional public safety 700 MHz wireless broadband network.
- Policymakers should seek technical expertise from qualified and neutral third parties in decisions relating to cybersecurity.
- As the smart grid is a complex and interconnected system, it is critical that information sharing between stakeholders be supported in policy and in practice.
- DOE and state regulators should provide adequate funding for cybersecurity.
- The ability of software to be updated and/or upgraded should be a core engineering concept at all levels of the smart grid infrastructure.
- Internet Protocol should be the end-to-end network layer for smart grid communications.

SMART GRID BENEFITS

REDUCE ENERGY CONSUMPTION & CARBON EMISSIONS

ICT, or smart technology, is clean energy technology, and nowhere is this more evident than in its application to the electric grid and the buildings connected to it. Application of ICT to develop a smarter electric grid will significantly reduce energy consumption and carbon emissions. The Smart 2020 Report projects that smart grid adoption in the US can enable the reduction of CO2 emissions by as much as 230-480 MMT of CO2 by 2020 and save $15-35 billion dollars in energy and fuel costs.[1] This is the equivalent of reducing emissions from electric power generation by 9% to 18% from estimated 2020 levels. As electric power generation accounted for 41% of all CO2 emissions in 2008, these savings are significant.[2] A January 2010 study by Pacific Northwest National Lab prepared for the US Department of Energy also projects that penetration of smart grid technologies will directly reduce electricity sector energy consumption and CO2 emissions by 12% by 2030 and will indirectly reduce emissions by an additional 6% by 2030.[3]

Smart grid technologies achieve these reductions in the following ways:

Providing Consumers Access to Energy Data

One significant benefit of a smart grid is that it can empower consumers to alter their energy consumption behavior 365 days a year by providing them with access to detailed and actionable energy usage data. Rather than receiving a monthly bill with a kilowatt hour and dollar figure without a point of reference, the smart grid enables consumers to receive near-real time usage data and adjust their behavior to lower their monthly electric bill. Known as the Prius effect, smart grid pilot projects have demonstrated that providing consumers with actionable consumption and pricing data leads to decreased energy consumption. A recent study by ACEEE projects that consumers with access to their energy usage data could cut their household electricity use by up to 12% and save $35 billion or more over the next 20 years.[4]

Reduction in Peak Demand

Periods of peak demand, when utilities must provide significantly more electrical power based on daily, monthly, seasonal, and annual cycles, requires utilities to construct power generation infrastructure capable of meeting and exceeding consumer demand to avoid outages. Reducing peak demand reduces utility power plant requirements saving consumers the increased rates that would accompany increased capital costs for utilities. An additional cost savings results from an overall decrease in wholesale electricity prices, as typically utilities will call into service generators that are more expensive to operate during periods of peak demand. A study by the Brattle Group estimates that a 5% reduction in peak demand would save consumers $10 billion annually.[5]

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[1] Smart 2020: Enabling the Low Carbon Economy in the Information Age US Report Addendum, 18, *available at* http://www.smart2020.org/_assets/files/Smart2020UnitedStatesReportAddendum.pdf.

[2] U.S. Energy Information Administration, Annual Energy Outlook 2010, Emissions Projections, *available at* http://www.eia.doe.gov/oiaf/aeo/pdf/trend_6.pdf.

[3] The Smart Grid: An Estimation of the Energy and CO2 Benefits, PNNL-19112, (January 2010), *available at* http://energyenvironment.pnl.gov/news/pdf/PNNL-19112_Revision_1_Final.pdf. The study assumed 100% penetration of smart grid technologies and a 25% renewable portfolio standard.

[4] ACEEE, Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Savings Opportunities, *available at* http://www.aceee.org/research-report/e105.

[5] The Brattle Group, "The Power of 5 Percent," The Electricity Journal, October 2007.

Smart grid technology enables demand response, which allows utilities to communicate time of use pricing to consumers, and consumers can opt to decrease their energy consumption based on the actual price of electricity during peak and non-peak periods. Consumers benefit both from savings on their bill as well as through incentive payments received through participating. Demand response also improves the reliability of the grid by improving the ability of electric utilities to avoid outages. In a National Assessment of Demand Response Potential, FERC found that demand response has the potential to decrease peak demand between 38 gigawatts (GW) and 188 GW, up to 20 percent of national peak demand through 2019, depending on how extensively demand response is applied. [6]

Line-loss Reduction in Transmission and Distribution

The U.S. Energy Information Administration reports that in 2008, transmission and distribution losses (T&D) were 6.14% of the total electricity used in the U.S.[7] Utilities concerned with operating their transmission systems efficiently must try to reduce line loss. Smart grid would help utilities reduce T&D losses, saving $7 million and 45K tons of CO2 emissions per million customers annually.[8] Smart grid technology would employ special protection schemes (SPS's) to allow for changes in demand or generation, and stabilize the system as a whole. SPS's are smarter control systems, using better communication architecture to help reduce the peak load relative to loading on the distribution circuit, which would reduce line congestion and loss. All of this would work to improve the ability of the grid to respond to end-user demand, improving the reliability of the system.

In order to provide the utility with this T&D information, regional transmission organizers (RTO's) have employed the use of "syncrophasors" to provide utilities with improved data. Synchrophasors are able to measure transmission rates up to 30 times per second, providing grid operators with more information at a faster rate. Traditional technology provides operators with transmission data about once every four seconds. This information not only allows operators to respond to demand quicker, but helps protect and maintain the grid. The Department of Energy (DOE) is currently involved in a price-matching scheme with RTO's around the nation, to provide incentives for their use of syncrophasors.

Integration of Renewables

Renewable energy can play a significant role in reducing the United States' greenhouse gas emissions, and providing us with a safe, sustainable energy source. Integrating renewable energy into our current electricity grid also poses several challenges. Renewable energy (i.e. solar power or wind power) is an intermittent power source – we cannot dictate when the sun will shine or the wind will blow. Intermittent energy, unlike centrally-generated energy, will bring with it considerable fluctuations of voltage and frequency throughout the system. This makes it challenging to coordinate the demand for energy with the supply of renewable energy available. Instead of receiving electricity from a power plant, renewable energy comes from widely distributed sources. These factors combined make integrating renewable energy into the grid a liability, with the potential to destabilize the grid.

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[6] FERC, A National Assessment of Demand Response Potential (June 2009), *available at* http://www.ferc.gov/legal/staff-reports/06-09-demand-response.pdf.

[7] U.S. Energy Information Administration, United States Electricity Profile, 2008 Edition.

[8] G.E., The Smart Grid: The Transmission View, Session 4, *available at* http://www.usea.org/USEA_Events/Smart-Grid-Briefings/Session_4-The_Smart_Grid-The_Transmission_View.pdf. The statistic assumes 0.2% loss reduction and 0.5% CVR peak load reduction resulting in reduction in fuel costs and deferral of generation capacity.

Smart grid technology helps facilitate the integration of renewable energy into the grid. Smart grid can help interconnect renewable electricity with centrally-generated electricity without disruption. Smart grid offers quicker, more accurate distribution data, which helps the system deal with fluctuations in voltage and frequency, stabilizing the system. Smart grid's "smart" acceptance of intermittent renewable energy is the only way to allow the current grid to accept large amounts of renewable energy. The DOE seeks to use renewable and distributed systems integration (RDSI) to achieve a 20% reduction in peak load demand by 2015. Smart grid would be able to intelligently match the amount of incoming energy with the needs of consumers, thus helping renewable energy penetrate the market, and become a more significant energy source.

Integration of Electric Vehicles

Current estimates state that that by 2015, more than 3 million electric vehicles will be on roads all around the world. While this is a huge step forward for electric vehicles and emissions reduction, this will also create a huge demand for electricity.[9] The electronic vehicle service equipment (EVSE) necessary to manage these plug-in hybrid vehicles (PHEV's) will have to be managed through ICT systems to be able to aggregate power demands and enable a coordinated response to changing grid conditions.[10] Smart grid technology will be able to not only allow the grid to respond to peak demand, but also help drivers choose the best times to charge their cars. By charging their car during periods of low demand, the driver would greatly reduce stress on the grid.[11]

"Smart charging" technology allows the charging to be delayed until periods of low demand, or when wind or solar power is readily available. An Xcel Energy study found that delayed charging "dramatically improves" the load put on the grid.[12] The study found that users of PHEV's employing "smart charging" techniques save approximately $450 per year on fuel costs. Off-peak charging equates to spending approximately $.62 per gallon, or 2 cents per mile. Xcel also found that widespread use of PHEV's could eliminate up to 50% of harmful vehicle emissions.[13] PHEV's using Smart grid technology would put a "modest" demand on the grid, while saving consumers money and eliminating harmful emissions.[14]

<u>CREATE JOBS</u>

TIA sees many similarities between the factors that led to the economic growth and job creation that followed the development of the Internet with the potential growth and job creation associated with the development of the smart grid. Like the communications sector, the electricity sector is ubiquitous. Both sectors touch virtually every person, every house, every school, and every workplace reaching into every other sector and enabling greater productivity and efficiency. The scale of the smart grid opportunity brings together ICT vendors, electric utility infrastructure vendors, high tech start ups,

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[9] Pike Research, "Investment in Electric Vehicle IT Systems to Total 5.1 Billion by 2015," *available at* http://www.pikeresearch.com/newsroom/investment-in-electric-vehicle-it-systems-to-total-5-1-billion-by-2015.

[10] *Id*.

[11] Craig Carlson, "Ford Pioneers Smart Grid-PHEV Communication System," *available at* http://www.glgroup.com/News/Ford-Pioneers-Smart-Grid---PHEV-Communication-System-42625.html.

[12] *See* National Renewable Energy Laboratory, Technical Report 640-41410, "Costs and Emissions Associated with Plug-In Hybrid Electric Vehicle Charging in the Xcel Energy Colorado Service Territory," *available at* http://www.nrel.gov/docs/fy07osti/41410.pdf.

[13] *Id*.

[14] The study found that when 30% of the vehicles used in the study were replaced were PHEV's deriving 39% of their power from electricity, there would only be a 3% load increase on the grid if smart charging was utilized.

service providers, and system integrators. The economic activity associated with the innovation, deployment, and services related to smart grid technology will lead directly to job creation. For example, KEMA projects that a disbursement of $16 billion in smart grid incentives would act as a catalyst in driving associated smart grid projects that are worth $64 billion. These projects would result in the direct creation of approximately 280,000 new jobs with 140,000 of those jobs persisting as permanent, on-going high value positions.[15]

COMPETE IN GLOBAL MARKETS

The global smart grid technology market represents a significant opportunity for smart grid solutions providers as well as the U.S. economy as a whole. Goldman Sachs Group foresees $750 billion in incremental spending for the global transmission and distribution market over the next 30 years. Smart grid technology will be a key driver in that market. Pike Research predicts $200 billion will be invested globally in the smart grid network between 2008 and 2015 with $53 billion expected to be invested in the U.S. alone.[16] BCC Research says the U.S. market for smart grid enabling technologies was $15.3B in 2008 and projects the sector will grow at a compound annual growth rate (CAGR) of 16.6%, increasing to $37.4 billion in 2014.[17] ABI Research estimates that cumulative global smart grid investment will reach $46 billion dollars by 2015 with $41 billion in transmission and distribution investments and $4.8 billion for smart meters.[18] Pike Research estimates that 250 million smart meters will be installed worldwide by 2015, up from 46 million in 2009. Pike predicts that in six years, 18% of the world's electrical meters will be either basic smart meters or advanced ones. North America will become the top region for smart meter adoption next year reaching 55% penetration by 2015. If policy and logistical obstacles can be overcome, the U.S. is in the position to become a global leader in developing smart grid technologies. The following countries with robust technology sectors also provide significant market opportunities as well as competition within the global smart grid market.

China

In 2010, China became the world-wide leader in smart grid investment, investing $7.3 billion in smart grid in the form of stimulus loans, grants, and tax credits[19]. 80% of this investment is input into the segments of power consumption, distribution, transformation, and communications. The State Grid Corporation of China has set a goal to fully deploy smart grid technologies by 2020.[20] China is anticipated to account for 18.2% the global household smart appliance market by 2015.[21]

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[15] *See* KEMA, "The U.S. Smart Grid Revolution: KEMA's Perspectives for Job Creation," *available at* http://www.kema.com/Images/KEMA_SmartGrid%20Jobs%20Creation_01-13-09.pdf.

[16] *See* Pike Research, "Smart Grid Investment to Total 200 Billion Worldwide by 2015," *available at* http://www.pikeresearch.com/newsroom/smart-grid-investment-to-total-200-billion-worldwide-by-2015.

[17] *See* BCC Research, "Enabling Technologies for the Smart Grid," (March 2009), *available at* http://www.bccresearch.com/report/EGY065A.html.

[18] *See* ABI Research, "Smart Grid Spending will Top $45 Billion by 2015," *available at* http://www.abiresearch.com/press/1688-Smart+Grid+Spending+Will+Top+$45+Billion+by+2015.

[19] *See* Zpryme, "Smart Grid China Leads Top Ten Countries in Smart Grid Federal Stimulus Investments," *available at* http://zpryme.com/news-room/smart-grid-china-leads-top-ten-countries-in-smart-grid-federal-stimulus-investments-zpryme-reports.html.

[20] *See* State Grid Corporation of China, *available at* http://www.sgcc.com.cn/ywlm/gsyw-e/234177.shtml

[21] *See* Zpryme, "Smart Grid Insights: Smart Appliances (March 2010), *available at* http://www.zpryme.com/SmartGridInsights/2010_Smart_Appliance_Report_Zpryme_Smart_Grid_Insights.pdf.

South Korea

South Korea is one of the top ten countries investing in smart grid, investing $824 million in smart grid in 2010.[22] South Korea plans on making substantial strides in smart grid investment over the next two decades, planning to complete a nationwide smart grid deployment by 2030.[23] Korea's Smart Grid Roadmap anticipates approximately $25 billion USD in investment with the government directly investing $1.9 billion on smart grid research and developmentresearch and development.[24]

Japan

Japan is a world leader in smart grid investment, investing $849 million in smart grid in 2010.[25] Japan was the unchallenged leader in smart grid investment in the 1990's, investing over $100 billion in smart grid over the course of the decade. As a result of this period of investment and change, Japan is now largely focusing on "last mile" smart grid investment, home side management, as well as solar power in the home.[26] In addition to investing in Japan's domestic smart grid market and integrating more renewable energy into the power grid, Japan is also currently engaged in smart grid trial products in other nations (including the United States).

EU

The EU is poised for major growth in smart grid investments in both the short and long term. The European Electricity Grid Initiative has established a nine year research and development program,[27] and European Commission's Strategic Energy Technology (SET) plan is calling for significant smart grid investment over the next ten years, in order to integrate renewable resources, and to be able to operate half of their utilities according to "smart" principles.[28] Annual European smart grid investment is expected to reach around 5 billion euro per year.[29] The EU has set a 2022 deadline for full deployment of smart meters. European markets are expected to spend up to $25 billion in order to meet mandates requiring the installation of smart meters rolling out 133 to 145 million by 2020.[30]

In surveying the global smart grid market, three themes quickly emerge. First, the size of the market opportunity is significant. Second, many countries with robust technology sectors are competing in the space. Third, smart grid deployments are moving forward rapidly. Several countries are in a strong position to take advantage of the smart grid opportunity. As with other technologies, early smart grid adopters will hold a significant advantage in the smart grid market. Unnecessary delays in resolving policy and logistical obstacles will be detrimental to those wishing to compete. TIA appreciates the priority that the Department of Energy, other federal agencies, and state regulators are giving to expeditiously resolve policy obstacles and is pleased to provide the following recommendations.

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[22] *See* Zpryme, "Smart Grid China Leads Top Ten Countries in Smart Grid Federal Stimulus Investments," *available at* http://zpryme.com/news-room/smart-grid-china-leads-top-ten-countries-in-smart-grid-federal-stimulus-investments-zpryme-reports.html.

[23] *See* Korea's Smart Grid Roadmap, *available at* http://www.smartgrid.or.kr/10eng4-2.php.

[24] *Id.*

[25] *See* Zpryme, "Smart Grid China Leads Top Ten Countries in Smart Grid Federal Stimulus Investments," *available at* http://zpryme.com/news-room/smart-grid-china-leads-top-ten-countries-in-smart-grid-federal-stimulus-investments-zpryme-reports.html.

[26] *Id.*

[27] *See* European Electricity Grid Initiative and Roadmap, *available at* http://www.smartgrids.eu/?q=node/170.

[28] *See* European Commission Strategic Energy Technology Plan (SET Plan), *available at* http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm.

[29] *Id.*

[30] *See* Greenbang Smart Meter Outlook 2020, *available at* http://www.greenbang.com/research/smart-meter-outlook-2020.

SMART GRID POLICY

While pilots, studies, and demonstration projects make the benefits of a smart grid clear, at this early stage in its development, the policy and regulatory framework in which the grid matures will significantly impact how smart the grid can become and the benefits it can achieve in both the short and long term. The smart grid policy-making environment is extremely complex. The size of the market and ubiquitous impact of the smart grid has attracted a large number of stakeholders with competing positions. Technology and solutions providers have distinct policy preferences suitable for their technologies, and it is not clear which technologies will be the most successful. Electric utility interests in the smart grid also vary significantly based on their organizational structure (investor-owned, public, or cooperative), service territory, and local political environment. The interplay between federal and state authority and the regulated nature of electric utilities adds an additional layer of complexity. Consumer and privacy advocacy groups also present diverse and sometimes conflicting viewpoints that further complicate smart grid policy making.

TIA believes this policy-making environment can be simplified by applying relevant principles from the ICT sector proven to benefit consumers and to facilitate technological innovation. In applying these principles to the smart grid, there will be a need for strong federal, state, and local coordination and cooperation because of the unique challenges in bringing together state and federal-regulated utilities and information and communications technology. To maximize the capabilities and benefits of smart grid technology, federal, state and local policy-makers will need to coordinate their efforts to create a policy framework that is **consumer-focused** and **technology driven**.

SMART GRID POLICY MUST BE CONSUMER-FOCUSED

As the end-users, TIA believes consumers will ultimately determine how successful the smart grid can become. For utility-driven smart grid solutions, utilities can only do as much as politically-accountable regulators will allow. The success of consumer-driven smart grid solutions will rest largely on consumer value and adoption. TIA recommends consideration of the following issues:

Provide Consumers with Access to Usage, Pricing, and Carbon Mix Data in Machine Readable Form for Use in Third Party Applications

While consumer preferences for both the manner and the amount of interaction with the grid will vary significantly by individual, the secure provision of energy consumption data to customers, utilities, and third parties will be critical to the development of the smart grid. Consumers and utilities share a dual ownership role with regard to the right to access customer energy consumption data. Customers should have a right to access consumption data in real-time or near real-time to both monitor and manage energy usage. Utilities should have a right to access consumption data necessary for management of the electric grid and billing purposes. TIA believes aggregate consumption data as opposed to device specific information is sufficient to meet most utility management and billing needs. Federal, state, and local government entities should have access to aggregate consumption data according to their jurisdictional requirements.

Third party service providers will play a role in providing competition and innovation in consumer home energy management services. In addition to accessing the data themselves, consumers need the ability to authorize access to that data in real-time or near real-time to third-party service providers. Whether the data is generated by customer-installed sensors or by the utility provider, customers should maintain control over which third parties are authorized to access personal billing and energy consumption information. TIA encourages the DOE to continue to work with stakeholders to define requirements for provision of the data as well as the cost to utilities for providing the data directly from the meter. State and federal policy-makers should work together to develop a uniform national policy.

Provide Consumers with Uniform and Consistent Privacy Policies

Uniform and consistent privacy policies will be critical to protect consumer information. TIA believes Fair Information Practice Principles (FIPPS) as provided by the US Federal Trade Commission should serve as the basis for developing policies regarding the privacy of energy consumption information. In developing specific policies and practices for energy data, the DOE and other policymakers should examine policies and self-regulatory models from other sectors that rely on both technology and strict procedures to protect critical data. The privacy framework for the smart grid should protect privacy without sacrificing innovation. In taking a comprehensive and in-depth look at smart grid privacy, the Privacy Subgroup of the Cybersecurity Coordination Task Group at NIST has published NIST IR-7628, which outlines their relevant findings and provides a broad framework for the privacy of smart grid data.[31] As a general rule, TIA believes customer authorization should be the prerequisite for releasing data to a third party.

Coordinate Smart Grid Stakeholders in a Sustained Consumer Awareness & Education Campaign

At this early stage in their development, smart grid deployments will require strong consumer and stakeholder engagement to educate consumers about the technology and alleviate concerns pre and post deployment. While consumer awareness of smart grid technology is improving, it remains relatively low. A GE study found that 79% of American consumers are not familiar with the term "smart grid", and only 4% of consumers have a good understanding of what a smart grid is.[32] The same GE study found that 96% of consumers who are familiar with smart grid are "overwhelmingly positive" about smart grid technology, and what smart grid can do for the United States.[33] Some consumer advocacy groups have voiced concerns about cost, accuracy, safety, and privacy of smart grid technologies. Because negative occurrences will receive more press than positive deployments, a sustained communication program will be critical to consumer adoption. TIA recommends sustained coordination between FERC, the DOE, state regulators, and other stakeholders to communicate positive smart grid accomplishments and to share what is being done to address customer concerns. FERC's National Action Plan on Demand Response is a positive development as are other consumer outreach programs.

Provide Incentives to Assist With the Purchase of Consumer Smart Grid Devices

The cost-benefit analysis for consumers is a crucial element for smart grid policy-making. Several smart grid deployments have been delayed based on state regulator concern with increasing rates. As utilities replace aging infrastructure and integrate renewables into the grid, consumers will likely be facing rate increases. Overall, bulk energy prices are also predicted to increase. Smart grid has the potential to

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[31] *See* NIST Guidelines for Smart Grid Cybersecurity: Vol. 2, Privacy and the Smart Grid (August 2010), *available at* http://csrc.nist.gov/publications/nistir/ir7628/nistir-7628_vol2.pdf.

[32] *See* GE Energy, U.S. Smart Grid Survey, Fast Facts: U.S. Consumer Impressions of the Smart Grid, *available at* http://itsyoursmartgrid.com/pdf/assets/resources/downloads/GE_U%20S%20%20smart%20grid%20survey%20fast%20facts.pdf.

[33] *Id*.

significantly offset these rate increases by empowering consumers with data to adjust their behavior, enabling demand response programs bringing down peak demand, and making electric utility operations more efficient passing savings onto consumers. Communication of this value proposition to consumers will need to come from industry, and federal and state governments.

TIA believes that incentives can play an important role in both funding and promoting awareness for consumer devices that interact with the smart grid. Incentives can act as a catalyst to spur consumer interest and accelerate greater interest and investment in the market. As the ICT industry has witnessed with the development of other technologies, low-income consumers will be best served through a regulatory environment that encourages innovation and competition, which brings down costs making technologies accessible to low-income consumers. Technological innovation throughout the ICT sector is improving performance and decreasing cost of deployment for smart grid applications. As initial costs could make home-to-grid technologies cost-prohibitive to some low-income consumers, TIA recommends that the government provide incentives to assist with the purchase of consumer smart grid devices.

SMART GRID POLICY MUST BE TECHNOLOGY DRIVEN

Technology Overview

Electric utility smart grid communications requirements will vary significantly based on the function, geography, and service territory of each utility. Each utility will need to assess their technology requirements on a case by case basis. Because of the diversity of applications and the evolving nature of the smart grid, there is no single technology or platform best suited for smart grid applications. For each application, there is a choice of more than one technology that may be suitable depending on the needs of the utility. Smart grid deployments may include a combination of Private Wireless, Commercial Wireless, Unlicensed Mesh, Point to Point Microwave, Private Fiber, Leased Wireline, PLC, Land Mobile Radio and Satellite Communications based on application requirements, availability, and cost. These technologies can roughly be divided between those better suited for point-to-point core (e.g. Fiber and Microwave) or point-to-multipoint access (e.g. Unlicensed Mesh, Private/Commercial Wireless (WiMAX, LTE, CDMA 2000 EvDO, HSPA), Fiber, PLC or a customer's existing broadband connection) applications based on utility requirements for reliability, security, latency, bandwidth, coverage and cost of deployment. Additionally, there are multiple consumer-facing technologies involved in smart grid deployments including home energy management systems, software, in-home displays, smart phone applications, internet portals, and consumer electronics devices as portals along with smart home appliances that can be connected to the grid.

In short, there are a multitude of technologies that can compete and are actively competing to provide smart grid solutions, and utilities will adopt technologies based on their requirements. To harness the innovation available from these technologies, it is critical to establish appropriate federal-level policies that define common goals and establish a common market for smart grid technologies. As a starting point, TIA recommends that the policymakers, regulators, and standards bodies take into account the following points:

Technology Neutrality Across an Open Smart Grid Architecture is Critical for Innovation of Smart Grid Solutions

At this early stage, it is impossible to predict which technology or combination of technologies will ultimately be the most successful. TIA recommends that federal and state governments either through the policy-making, regulatory or standards-setting process avoid excluding viable technologies or architectures and instead focus on the coexistence and interoperability of a group of viable technologies. As we have seen at the early stages of other developing technologies, technology neutrality is critical to create an ecosystem of competition and innovation. Technology neutrality will lead to increased innovation in smart grid technologies, increased options for a range of customer needs and preferences, and provide a reliable and secure grid that reduces energy consumption and costs for consumers. Allowing multiple technologies to compete to achieve the goals of a smart grid will increase investment in the market, spur more innovation in products and solutions, and future proof the grid allowing it to realize its potential. An open architecture where multiple interoperable technologies can coexist and compete is the most beneficial approach for both consumers and the development and deployment of the smart grid in the short and long term. Smart grid deployment plan requirements will need to provide adequate flexibility for utilities to adopt and integrate new solutions as they become available.

Allow for Voluntary Standards to Support the Dynamic Nature of ICT Innovation and to Maximize Flexibility and Choice in a Rapidly Changing, Market-Driven Ecosystem

Nowhere is the principle of technology neutrality more important to the development of the smart grid than in the standards development and identification process being coordinated by NIST. Alternative architectures could include a variety of combinations of smart meters, home energy management systems, Internet-based energy management services and other methods to support ongoing innovation. At this stage, technology neutrality, flexibility in standard-setting and reliance on voluntary standards are key to the development of the smart grid. Standards are important tools to promote efficiency, interoperability, and innovation by making products and services work together better. By helping to enhance interoperability among products and services within a market, and being responsive to real marketplace needs, standards can help promote innovation, fuel market growth, protect investment in new technologies, and bring down costs. However, standards are only a means to an end. They are useful tools if they are effective at addressing a real marketplace need.

Given the dynamic nature of innovation and ICT standards development, governments should be cautious about mandating adherence to any particular standard without demonstrating sufficient need and without support from impacted industry and relevant stakeholders. Mandated standards can disrupt normal marketplace outcomes and discourage competition. In addition, identifying a single standard that is appropriate for all circumstances is extremely difficult, if not impossible. The breadth and depth of the ICT environment means that there is rarely, if ever, a one-size-fits-all solution. Moreover, because the world of technology typically moves at a far greater pace than the policy-making, regulatory and legislative processes, it is quite possible for a government to mandate a standard that becomes irrelevant in the marketplace over time. Standards do best as part of an active, competitive habitat. For governments that want to foster innovation in their technology sectors, it is vital to encourage new technologies, valuable intellectual property, improved human capital, venture investments, and economic growth. Mandating distinct standards potentially dampens incentives to innovate in that technology area, and can have adverse effects on both economic and social benefits.

While standards can promote interoperability, they do not guarantee it. Standards can best support interoperability when they are part of a multi-faceted approach incorporating open standards-setting processes, proactive standards maintenance and a strong effort to ensure that different implementations of the same standard will in fact interoperate.

Under NIST Special Publication 1108 (the NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0), some of the "Guiding Principles for Identifying Standards for Implementation" include:

- Is well-established and widely acknowledged as important to the smart grid.
- Is an open, stable and mature industry-level standards developed in consensus processes from a standards development organization (SDO).
- Has, or is expected to have, significant implementations, adoption, and use.
- Is supported by an SDO or Users Group to ensure that it is regularly revised and improved to meet changing requirements and that there is strategy for continued relevance.

Before mandating adherence to any standard recommended by NIST and the Smart Grid Interoperability Panel, FERC should first consider whether the standard is in fact likely to be widely implemented by stakeholders on a voluntary basis. In that situation, FERC should consider recommending such standards instead of including them in a regulatory framework in order to preserve further innovation and competition in the marketplace and the opportunity to make further improvements to the standard over time in response to perceived needs for improvements.

TIA recommends that state regulators should defer adoption of standards until NIST has progressed in identifying smart grid standards and protocols. Adoption of standards and protocols at the state level is premature given the ongoing status of the NIST process. The ICT industry is actively engaged with the NIST in helping them fulfill their responsibility of coordinating standards and protocols for the interoperability of smart grid solutions. After the NIST process has progressed, TIA recommends that state regulators then evaluate any additional issues involving standards or protocols that the will need to address beyond the NIST process.

Provide Additional Funding for Both R&D and Off the Shelf Smart Grid Deployments Across the Span of Viable Technologies and Architectures to Evaluate Technology Effectiveness at Scale

TIA believes DOE stimulus funding for smart grid projects has played and will continue to play a critical role as a catalyst for the smart grid market, across the span of viable technologies and architectures to evaluate technology effectiveness at scale For these reasons, TIA encourages additional funding for the DOE for both R&D and off the shelf smart grid deployments. The DOE received 565 applications totaling requests of $14.6 Billion USD for the Smart Grid Investment Grant (SGIG) program and the Smart Grid Demonstration program, which were only budgeted $4.5 Billion. The initial funding provided significant stimulus and investment in the smart grid market, and TIA encourages additional funding in both R&D and actual deployments. TIA encourages DOE funding for each viable technology and architecture. In addition to stimulating interest in the market, DOE funding serves another significant benefit for early adopters as they submit applications to their relevant state regulatory bodies. By providing a financial cushion, it removes some of the risk for regulators in approving rate increases for the adoption of relatively new technologies. For future smart grid funding, the DoE and

Congress will evaluate the impact of these initial smart grid projects in terms of increased energy efficiency and jobs created and will then determine whether to provide more funding in the future. For the same reasons, state governments should also provide funding for smart grid R&D and as well as deployments.

SPECTRUM

DOE Should Coordinate with the FCC to Enable Greater Use of Current Licensed and Unlicensed Spectrum by Smart Grid Applications, Including the Consideration of Future Growth of Smart Grid Services

Both unlicensed and licensed spectrum will play important roles in enabling smart grid technologies. Utilities will require access to more licensed spectrum.

Advanced Metering Infrastructure (AMI) will need to transition from the use of unlicensed mesh to broadband as data rate requirements increase. Utilities currently rely significantly on 900 MHz Unlicensed Mesh for basic Advanced Metering Infrastructure (AMI) for last-mile communications to customer premises. Unlicensed Mesh is a cost effective, point-to-multipoint technology in high density urban and suburban deployments because of the short distance between meters. Basic AMI functions like meter reading can currently be accommodated on 900 MHz Unlicensed Mesh as they are delay-insensitive, lower bandwidth and require significantly lower data rates than other smart grid applications. As AMI becomes more advanced, however, increased data rate requirements and potential spectrum interference in unlicensed bands will present challenges for the use of 900 MHz Unlicensed Mesh for future smart grid applications and may require migration to other wireless technologies that support broadband communications.

Existing licensed spectrum is inadequate to support future smart grid applications. Wireless broadband is an essential technology for the current and future operation of the smart grid. Utilities have stated a strong preference to transition to wireless broadband smart grid systems where possible, citing coverage, low cost of deployment and proven reliability during storm events. Technology advances in wireless broadband are improving latency and increasing data rates, enabling the technology to be used to serve more critical core grid functions. TIA believes that existing licensed spectrum for utilities is inadequate to support core smart grid applications. Availability of more licensed spectrum for broadband will become critical as smart grid applications require more bandwidth. TIA believes that the DOE needs to work with the FCC to develop a path forward to increase availability of licensed spectrum for wireless broadband applications, taking into account the spectrum needs that will arise from smart grid developments.

Carrier networks will become an increasingly important option for smart grid deployments. TIA believes utilities will rely on commercial networks for many low risk and high capacity smart grid applications such as AMI and electric vehicles. Improvements in wireless technology and carrier-utility service level agreements will make carrier networks a significant resource for utility smart grid deployments. With a demonstrated record of incorporating robust cybersecurity into their networks, carrier networks are able to meet the security requirements for smart grid applications.

TIA Recommends that the FCC Should Allow Utilities to Use the Local and Regional Public Safety 700 MHz Wireless Broadband Network

As the FCC noted in the National Broadband Plan, utilities and public safety have very similar communications requirements. Allowing the use of this secure network by such entities will increase coordination between public safety and other vital entities and allow for quicker, more educated, and better harmonized efforts. TIA supports, as the FCC reviews waiver petitions to deploy local and regional public safety interoperable broadband networks early, rapid approval allowing public safety the discretion to allow appropriate entities to operate in the 700 MHz public safety broadband network that will further their mission.

CYBERSECURITY

Policymakers should Seek Technical Expertise from Qualified and Neutral Third Parties in Decisions Relating to Cybersecurity

By addressing cybersecurity early in the process, smart grid stakeholders can benefit by instituting optimal security policies and principles prior to the deployment of new technologies. Cybersecurity requires good security processes up front and ongoing management to mitigate current and emerging threats. Utility regulators can benefit from best practices developed in other industries such as finance, information technology and healthcare that rely on ICT to protect assets and information.

On technical matters, TIA encourages policymakers and utility regulators to seek the opinion of qualified and neutral third parties when evaluating and rendering smart grid decisions that involve ICT as well as looking to established guidelines such as those provided by NIST. The convergence of ICT and energy services represents a major transformation of our energy infrastructure and TIA believes that consumers would be best served if the capabilities of ICT are well understood by regulators and leveraged where appropriate. In particular, the technical aspects of securing smart grid and smart meter communications and protecting customer data are highly complex. Smart grid decisions based on inadequate information may result in systems containing vulnerabilities that negatively impact the reliability of energy services, the privacy of consumers, and the ability of the smart grid to deliver on its full potential. It may further result in undesirable post-deployment costs to remediate security shortcomings that could have been avoided through an independent information security assessment during the planning stage and the use of proven secure development and deployment processes. There are several qualified sources of important information around security and privacy best practices in the government and private sector that can assist in evaluating the security of a proposed implementation.

As the Smart Grid is a Complex and Interconnected System, it is Critical that Information Sharing between Stakeholders be Supported in Policy and in Practice

Information sharing is where information regarding threats, incidents and other events is voluntarily shared through established channels. There needs to be a robust, transparent process and climate for sharing of this type of information and that the information shared will be treated confidentially where necessary. In this manner, stakeholders are able to collaborate across sectors and even borders to better manage threats. Each party brings its expertise to the table, and all benefit from one another’s continuous, shared contributions.

DOE and State Regulators Should Provide Adequate Funding for Cybersecurity
DOE recently provided $30 Million in funding for projects aiming to address cybersecurity for the electric grid. DOE should continue to fund cybersecurity projects as smart grid technologies become more widespread. State regulators should provide adequate funding to enable utilities to acquire the necessary resources to build robust cybersecurity into their networks. State regulators should coordinate efforts in communicating best practices for cybersecurity.

TECHNOLOGY CONSIDERATIONS

The Ability of Software to be Updated and/or Upgraded Should be a Core Engineering Concept at All Levels of the Smart Grid Infrastructure
One of the core value propositions of a smart grid infrastructure will be adaptability due to the use of software integrated into devices at all levels. This provides benefits in terms of extending the useful lifetime of equipment as new techniques become available. The ability to update is also critical from a cybersecurity perspective as new vulnerabilities are uncovered. The ability to quickly and efficiently mitigate those vulnerabilities with a software updating process becomes a critical component. In order to realize these benefits, component of the smart grid must be able to be updated on a faster schedule than traditional electric power equipment.

Internet Protocol Should be the End-to-End Network Layer for Smart Grid Communications
TIA recommends the use of Internet Protocol (IP) as an end-to-end network layer for smart grid communications where feasible. IP has many qualities ideal for the development of the smart grid:

- IP is a proven and mature suite of protocols.
- The security of IP is understood and tools and applications exist to manage and deploy it securely.
- IP is interoperable, which minimizes costs and discourages technology silos.
- IP is reliable and self-healing as the technology will automatically avoid failed transmission links to ensure delivery of communications.
- IP is scalable and flexible allowing for loose coupling between the physical communications network and the applications on the network regardless of the underlying physical infrastructure.

CONCLUSION

TIA appreciates this opportunity to provide our perspective on the development of the smart grid and looks forward to working with the Department of Energy and other stakeholders moving forward.

Respectfully Submitted,

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