National Institute of Standards and Technology (NIST)
Smart Grid Advisory Committee (SGAC)
Report

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Overview of NIST's Energy and Independence Security Act of 2007 Responsibilities and the Smart Grid Interoperability Panel

The National Institute of Standards and Technology (NIST) supports one of the key roles in the growth of the Smart Grid—bringing together manufacturers, consumers, energy providers, and regulators to develop "interoperable standards." In other words, NIST is responsible for making sure the many pieces of "the world's largest and most complex machine" are able to work together.

Since its establishment in 1901, NIST has earned a reputation as an "honest broker" that works collaboratively with industry and other government agencies. Over the past century, NIST's mission has been to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

In the role of an "honest broker" and based on its history of advancing technical standards testing and development, under the Energy Independence and Security Act of 2007 (EISA 2007), NIST was given "primary responsibility to coordinate development of a framework that includes protocols and model standards for information management to achieve interoperability of smart grid devices and systems."

In April 2009, NIST announced a three-phase plan and process to carry out its EISA responsibilities, and a month later, the Secretaries of Commerce and Energy gained the support of this plan and process from nearly 70 top executives from the power, information technology, and other key industries. In November 2009, NIST led the establishment of a public/private partnership called the Smart Grid Interoperability Panel (SGIP) to continue development of interoperability standards and drive longer-term results. The SGIP provides an instrument for NIST to "solicit input and cooperation from private entities and other stakeholders," as directed by EISA. The Smart Grid Advisory Committee (SGAC) agrees with the Federal Energy Regulatory Commission (FERC) that "the best vehicle for developing smart grid interoperability standards is the NIST interoperability framework process, including the work of the SGIP and its committees and working groups." During its first two years of existence, the SGIP continues to:

- Establish processes and procedures for its work;
- Oversee and expedite the completion of the Priority Action Plans (PAPs);
- Create additional action plans as needed;
- Develop cybersecurity guidelines; and
- Develop a testing and certification framework.

At the time of the writing of this report, membership in the SGIP has grown to over 750 organizations and approximately 1,900 individuals currently participate in the various committees, working groups, and working teams within the SGIP structure.

In January 2010, NIST reached a major milestone with the publication of the Release 1.0 Framework and Roadmap for Smart Grid Interoperability. This document provides an initial foundation for an interoperable and secure Smart Grid. In October 2011, a draft of Release 2.0 was made available, and NIST sought public comment by the end of November 2011. In September 2010, another significant milestone in the development of the NIST framework was the publication of NIST Interagency Report (IR) 7628, "Guidelines for Smart Grid Cyber Security." This three-volume document provides the foundational requirements and guidance for efforts to ensure cybersecurity in the Smart Grid.

To date, the work and determination of NIST, the SGIP, and its participants have resulted in a number of critical Smart Grid standards deliverables, which include:

- Smart Meter Upgradeability Standard that will ensure that many of the large number of meters to be installed over the next several years can be upgraded to accommodate anticipated updates to metering standards.

- Internet Engineering Task Force Request for Comments (RFC) 6272, which specifies the various Internet protocols to be used in the Smart Grid.

- Publication of NIST IR 7761, which provides guidelines for utilities and their suppliers to assess wireless communications standards for use in various Smart Grid applications.

- A customer energy-usage information data standard that enables entrepreneurs to develop third party applications to help customers to monitor their energy usage and save money.

- The selection of three standards published by Society for Automotive Engineers (SAE) International to support electric vehicle charging.

- Publication of an "SEP 1.x to 2.0 Transition and Coexistence" guideline, which will ensure that meters that have already been deployed using early versions of the Zigbee Smart Energy Profile (SEP) will be able to interoperate with future IP-based home area networks.

- Creation of the Catalog of Standards, containing descriptive information about standards deemed relevant to the Smart Grid through the SGIP's consensus process. This catalog will provide key input to future releases of the NIST framework.

NIST's scope and work have not simply been limited to or focused solely on Smart Grid interoperability standards identification and development and on coordinating activities and processes in the United States or North America. As NIST states on their website:

> "the Smart Grid will span the globe, and the United States is not alone in its initiative to modernize the electric grid. A number of

> other countries have launched significant efforts to encourage the development of the Smart Grid in their own countries and regions. As countries move forward with their individual initiatives, it is very important that Smart Grid efforts are coordinated and harmonized internationally. An essential element of this coordination will be the development of international standards."

As with their efforts in the United States, NIST is assigning a significant amount of its resources and attention to bilateral and multilateral engagement with other nations to collaborate in the development of international standards for the Smart Grid. Among the nations that have already or will begin investing in Smart Grid infrastructure are:

- Canada
- Mexico
- Brazil
- the EU, including many member states
- Japan
- Korea
- Australia
- India, and
- China

NIST and the International Trade Administration (ITA) have also partnered with the Department of Energy to establish the International Smart Grid Action Network (ISGAN), a multinational collaboration of 17 nations. ISGAN complements the Global Smart Grid Federation, a global stakeholder organization that serves as an "association of associations" to bring together leaders from Smart Grid stakeholder organizations from around the world.

The Smart Grid Advisory Committee (SGAC) commends NIST for providing both national and international leadership to assist the industry in the creation of Smart Grid interoperability standards. NIST, with the creation of the SGIP in November 2009, has led the development of an open, collaborative, and public process that engages industry, government, and consumer stakeholders across the Smart Grid ecosystem. NIST's work to establish Smart Grid interoperability protocols and standards has been carried out both methodically and with a sense of urgency, and NIST is to again be commended for the enormous task it has undertaken and for its many accomplishments over the last two and a half years as outlined above.

Overview of NIST Smart Grid Advisory Committee

In September 2010, NIST named 15 individuals from U.S. industry, academia, and trade and professional organizations to serve on its Smart Grid Advisory Committee (SGAC). (See Attachment I for the *Federal Register* Notice: *Establishment of NIST Smart Grid Advisory Committee and Solicitation of Nominations for Members.)* Dan Sheflin, Chief Technology Officer at Honeywell Automation and Control Systems, chairs the Committee, and David Owens, Executive Vice President of Business Operations at the Edison Electric Institute (EEI), serves as vice chair. The Committee held its first meeting on September 29, 2010. The 15 members of the SGAC are (full committee bios are provided in Attachment II):

Dan Sheflin, Chair
Chief Technology Officer
Honeywell Automation and Control Systems

David Owens, Vice Chair
Executive Vice President, Business Operations
Edison Electric Institute

Jon Arnold
Managing Director, Worldwide Power & Utilities Industry
Microsoft Corporation

William O. Ball
Executive Vice President and Chief Transmission Officer
Southern Company

Lynne Ellyn
Senior Vice President and Chief Information Officer
DTE Energy

Evan R. Gaddis
President and Chief Executive Officer
The Association of Electrical Equipment and Medical Imaging Manufacturers (NEMA)

Lawrence E. Jones
Vice President, Regulatory Affairs, Policy and Industry Relations
ALSTOM Grid

Suedeen G. Kelly
Partner
Patton Boggs, LLP

Susan M. Miller
President and Chief Executive Officer
Alliance for Telecommunications Industry Solutions (ATIS)

Terry Mohn
Founder and Chief Strategy Officer
General MicroGrids, Inc.

Kevin F. Nolan
Vice President of Technology
GE Appliances

Simon Pontin
Chief Technology Officer
Itron Oconee Manufacturing Facility

William H. Sanders
Director, Information Trust Institute and
Donald Biggar Willett Professor of Engineering
University of Illinois at Urbana-Champaign

Thomas J. Tobin
Chief Technology Officer
S&C Electric Company

David Vieau
Chief Executive Officer and President
A123 Systems

According to its Charter (See Attachment III), the Committee is to provide input to NIST on the Smart Grid interoperability standards, priorities, and gaps, and on the overall direction, status, and health of the Smart Grid implementation by the Smart Grid industry, including identification of issues and needs. Input to NIST will be used to help guide the activities of the Smart Grid Interoperability Panel (SGIP) and also to assist NIST in directing Smart Grid-related research and standards activities. The duties of the Committee are solely advisory in nature in accordance with the provisions of the Federal Advisory Committee Act (FACA).

During the initial SGAC face-to-face meeting, held at NIST Headquarters in Gaithersburg, MD, on September 29, 2010, the Committee discussed plans for producing a report to be delivered to NIST by the end of 2011. The Committee members agreed upon four major topic areas or areas of focus that were to serve as the basis for the formation of four individual subcommittees and the production of this report. The four major topic areas that were agreed upon were: short-term, medium-term, long-term, and research direction gaps. Subsequently it

was determined that the focus and efforts of Subcommittees One and Two (short-term and medium-term) should be combined for the purpose of developing this report.

A follow-up face-to-face meeting was again held at NIST on March 24, 2011, whereupon individual subcommittee leads provided Committee members with progress reports and a detailed discussion regarding the steps in the development of a final report—an initial outline/table of contents, a timeline, and a Committee research and review process.

In August 2011, a final series of industry interviews was conducted by the four subcommittees to further inform the development of the report throughout Fall 2011. On November 29, 2011, the SGAC held a face-to-face meeting at NIST to conduct a final review and adoption of this report.

Executive Summary

In September 2010, Dr. Patrick Gallagher, Director of the National Institute of Standards and Technology (NIST), charged the Smart Grid Advisory Committee (SGAC) with providing input to NIST on: (1) the Smart Grid standards, priorities, and gaps, and (2) the overall direction, status, and health of Smart Grid implementation by the Smart Grid industry, including identifying issues and needs. The SGAC formed four subcommittees to address this challenge. Over the ensuing 14 months, the subcommittee members have worked with and interviewed Smart Grid industry stakeholders, including industry associations, companies, and state and federal regulators, to gather, consider, and analyze information and produce this status report. It should be noted that the content and recommendations found in this report are premised on the many industry interviews that were conducted prior to September 2011 and may not reflect discussions, initiatives, activities, or developments that are subsequently taking place within the SGIP or other stakeholder forums. Through its efforts, the SGAC has identified several common emerging themes across the diverse Smart Grid stakeholder landscape.

Emerging Themes from the NIST SGAC Report

- **Prioritize, streamline, and leverage NIST Smart Grid activities**
  - With multiple organizations vying for the input of the Smart Grid community, the stakeholders', especially the utility and regulatory communities', already-scarce resources are worn thin, and the overall pace of standards development is overwhelming, especially for electric utilities and regulators. For this reason, NIST, SGIP, and other organizations working to advance the Smart Grid need to prioritize and consolidate their efforts. This will allow these stakeholders to focus on the most urgent issues and use their resources in the most efficient way possible to reach meaningful conclusions. From the perspective of report interviewees, there is a clear lack of standards prioritization and delineation of roles of various SGIP stakeholders.

- **Need for consistent state regulatory support for Smart Grid standards development**
  - In order for Smart Grid standards to be effectively implemented, there must first be a supportive state regulatory regime. The Committee recommends that utilities communicate with state regulators through the National Association of Regulatory Utility Commissioners (NARUC) to garner support. State public utility commissions (PUCs) will need to have a solid understanding of the Smart Grid, because they will be the entities responsible for approving utilities' plans for deployment of Smart Grid technology. Lack of understanding and cooperation at the PUC level could discourage utilities from participating due to concerns about stranded investments and cost recovery. The SGIP and NIST should strive to strengthen relationships and participation in NARUC and the FERC-NARUC Smart Response Collaborative. State PUCs should be encouraged to be actively involved

with NARUC and the NARUC Smart Grid activities. In addition, the work and perspective of those activities need to be incorporated into the SGIP.

- **Need to continue the focus on transparency, roles, and responsibilities**
  - To the extent there is hesitation or a lack of participation by stakeholders in the Smart Grid due to a lack of understanding of the SGIP process, the roles of federal and state agencies, and the effects of the standards on businesses and consumers, need to be more clearly communicated and socialized. Clearly defining the roles and responsibilities of these various entities within the SGIP, as well as providing a better explanation to participants involved in those activities of what is expected of them, would constitute an important first step. Greater transparency, combined with heightened educational efforts, will allow stakeholders at all levels to work together toward this objective.

- **Consolidation of cybersecurity activities and research**
  - As with the need to consolidate Smart Grid activities discussed above, the need to consolidate cybersecurity activities and research is also driven by a scarcity of resources. With multiple organizations working on cybersecurity activities and research, there are not enough experts and resources to satisfy the demands of each group. NIST and the Cybersecurity Working Group (CSWG) should continue to consolidate these efforts so that the experts and other industry resources can be used to their highest potential to forward the common goals of the currently competing cybersecurity activities.

- **Urgent need for a communication plan and an education and outreach effort regarding importance of interoperability standards and research activities**
  - It is important that Smart Grid stakeholders understand the value of the new business models enabled by the SGIP and resulting standards. The industry as a whole has to be able to quantify both operational risks and financial benefits in a way that is convincing to the customers, regulators, and utility leaders. Without clear metrics for the customer, it will be difficult to evaluate the benefits of the various programs. SGIP should develop a marketing campaign targeting the Smart Grid stakeholders with the objective of clarifying and highlighting the importance of interoperability standards and their valuable impact on businesses and consumers.

The Committee through its interview process has also identified themes within each section of this report relative to NIST's short-term, mid-term, and long-term goals, as well as its research activities. These themes are outlined below.

Short- to Mid-term Challenges and Recommendations

In assessing the challenges and recommendations for NIST in the short- to mid-term, the SGAC Subcommittees One and Two interviewed 21 Smart Grid stakeholders, primarily from the

electric utility and state regulatory communities actively engaged in the SGIP.[1] The following four themes emerged:

- **Reliability and implementation review of interoperability standards is critical**
    - Interoperability standards will need to undergo a formal review process with respect to reliability and implementation readiness. The Committee recommends that this review be undertaken by industry representatives who have the primary responsibility for safety, operation, and reliability of the grid. In their review, the industry representatives should focus on reliability considerations, implementation readiness, cyber impacts, stranded costs, and impacts on legacy systems of the utilities.

    - Additionally, for the effective implementation of the Smart Grid, utilities will need to take an active role in identifying and developing interoperability standards. Utilities will also need to evaluate the impact of potential Smart Grid technologies on their systems and perform the necessary due diligence required by their respective regulatory bodies. To facilitate and oversee the utilities' efforts, the Committee recommends that the SGIP form a standing Implementation and Reliability Committee (IRC). The IRC would operate within the SGIP process in the same manner as the existing SGIP standing committees, and would consist of the appropriate utility and regulator representatives.

- **Prioritization of the standards, processes, and forums are necessary for greater utility and state participation**
    - The SGIP process needs the participation of experts from the utility and regulatory stakeholder communities. However, the major roadblock to their participation is the lack of resources in comparison to the multitude of Smart Grid activities demanding their time and expertise. As discussed above and according to interviewees, utility and regulatory stakeholders in the Smart Grid have limited resources, and it is necessary to prioritize and consolidate the standards process in order to make the most effective use of experts.

- **Urgent need for a communication plan and an education and outreach effort for greater utility and state participation**
    - Utility and regulatory stakeholders are often discouraged from participating in the process because they do not understand the impact the standards will have on them and the risk of non-engagement and non-compliance. The SGIP's Communication, Marketing, and Education (CME) Working Group should be encouraged to expand its role and to develop a comprehensive marketing plan to educate these stakeholders and encourage their involvement in the SGIP process.

[1] Note that together these represent four of the twenty-two stakeholder categories identified by the SGIP.

- **Need for regulatory certainty to ensure cost recovery of investments related to Smart Grid deployment**
    - The Committee has identified regulatory certainty as a leading priority for the Smart Grid. To achieve this, industry participants and regulators will need to be involved in identifying and developing interoperability standards. One practical effect of standards vetted by the industry and across regulatory jurisdictions will be to minimize the impact of stranded costs and to manage the potential for equipment obsolescence.

For more information on the Committee's recommendations for NIST in the short- and mid-term, please see Section One at page 15.

Long-term Evolution of the U.S. Smart Grid Effort

The SGAC Subcommittee Three focused on defining the structures, roles, and relationships of the U.S. Department of Energy, NIST, and the SGIP as they are now and as they will need to evolve to advance the goals of the Smart Grid five years in the future. The following three themes emerged from the subcommittee's research:

- **NIST will need to organize for its changing role by 2015 and beyond**
    - As the Smart Grid evolves over the next five years, the challenge will be to change the form and structure of the NIST Smart Grid business unit and the SGIP. NIST will need to develop greater expertise in the technological and administrative functions necessary to support the Smart Grid. NIST will also need to be prepared to support state and federal regulators after adoption of its standards, as well as advise the U.S. Congress and other federal agencies on the Smart Grid. Finally, NIST will need to be able to provide advice on cybersecurity issues to federal agencies and develop a cybersecurity response plan.

- **Over the next five years, there will also be a need for interagency collaboration**
    - Under the Energy Independence and Security Act of 2007 (EISA 2007), federal agencies were granted certain responsibilities that will carry over to their respective roles in the Smart Grid. NIST will need to collaborate with each agency in order to ensure that its standards are acceptable in each regulatory jurisdiction.

    - Furthermore, NIST and DHS will need to collaborate to define the federal response to national cyber emergencies.

- **NIST will need to reach out to industry to seek further input**
    - NIST standards, particularly the standards for cybersecurity, will need to apply to various types of existing technologies. NIST will need to interact with industry in order to develop standards that will both meet the needs of the Smart Grid and apply practically to existing technologies.

For more information on the Committee's recommendations for NIST's evolution over the next five years, please see Section Two at page 27.

Recommendations on NIST Smart Grid Research Activities

In Section Three, the SGAC Committee Four interviewed 15 Smart Grid stakeholders and gathered specific recommendations regarding areas of NIST Smart Grid research. The following are three of the major themes that emerged:

- **Facilitator of Multi-Stakeholder Smart Grid Research Collaboration**
  - NIST should take advantage of the multi-stakeholder SGIP and play the role as the convener of workshops on Smart Grid research in order to ensure that the focus of these entities' research agenda supports the activities to develop interoperability and other Smart Grid standards.

- **Collaboration with Utilities and Private Sector**
  - NIST should invite and promote strong collaboration with utilities and the private sector on research into metrics for interoperability, cybersecurity, and other properties of the Smart Grid. Such collaboration could lead to more jointly-funded R&D efforts, and could also improve the support for NIST activities by Congress.

- **Continue Research in Electric Power Metrology**
  - NIST should conduct research to determine the metrology requirements for Smart Grid devices, including research that aims to reduce the number of interfaces between different devices. NIST should build upon the work it has already started on electric power metrology for the Smart Grid. Over the coming decades as the Smart Grid continues to evolve and new sensors and actuators are developed, there will be a need to ensure that the measurements are accurate and that the controls are acting, and at the same time satisfying the standards for interoperability. NIST should continue to conduct power grid metrology research to also include identifying new kinds of quantities that characterize the system-level behavior or the Smart Grid.

For more information on the Committee's recommendations for NIST Smart Grid research activities, please see Section Three at page 35.

Section One: Short- to Mid-term Challenges and Recommendations

Introduction

This section of the report represents the combined work of SGAC Subcommittees One and Two focused on the short- and mid-term challenges and recommendations. Particular focus was given to utility and state regulatory engagement issues within the SGIP by Subcommittee One. This section incorporates the overall perspectives aggregated from 21 interviews primarily of electric utility and state regulatory stakeholders actively participating in the SGIP process,[2] as well as many SGIP standing committee and working group leaders. Specific gaps and areas of concern, as offered to the Committee throughout the review process, are outlined and discussed in detail below.

As an initial step within this section of the report, it is essential to provide the reader a broader industry context as a backdrop to the areas of concerns around utility and regulator engagement as expressed by the interviewees. By providing this context prior to presenting the discussion below, it is believed that those reading this report will gain a much better understanding and appreciation for some of the potential underlying "root causes" of utility industry and regulator perspectives that the issues, concerns, and recommendations stem from when presented later in Section One.

Electric Utilities Are Unique Stakeholders As They Relate to the Smart Grid and Their Core Mission to Provide Safe, Cost Effective, and Reliable Power to Customers

From the perspective of the utility sector and those specifically interviewed for this section of the report, it is important to understand some fundamental attributes or aspects of the utility sector—the role of electric grid investor, the basic business model, and the regulatory environment in which the sector operates—that highlight the unique role of the utility in the Smart Grid ecosystem. These differences are evident from the perspectives of investing in the grid, how is the grid regulated, and the utility's ultimate responsibility for overall system reliability. It is for these reasons, which are expanded upon below, that this contextual introduction to the report focuses much of its discussion on issues within the SGIP process of particular concern to electric utilities, including the need for increased regulator involvement, a focus on reliability issues and concerns, and the need for standards prioritization.

Electric Utilities Will Be Making the Majority of Investments to Modernize and Transform the Electric Grid

It is widely recognized that significant levels of information technology, telecommunications, and cybersecurity improvements are necessary to further modernize and transform the grid. In the initial round of Department of Energy ("DOE") funding awarded under the American Recovery

[2] Note that together these represent four of the twenty-two stakeholder categories identified by the SGIP.

and Reinvestment Act ("ARRA") for Smart Grid projects, approximately 95 percent are either investor-owned electric utilities, electric cooperatives, or municipal electric utilities.

It is Essential That Utilities Take an Active Role in the Deployment of the Smart Grid and the Development and Identification of Appropriate Standards

The work of the SGIP and the continued modernization and transformation of the electric grid each require that utilities are active in the identification and development of interoperability standards. This needs to be done while at the same time evaluating the potential impacts of smart technologies on utility systems and while performing the necessary cost/benefit analysis that is required by state and federal regulatory agencies.

Utility involvement is essential in order to minimize the impact of stranded costs and to manage potential equipment obsolescence. From the perspective of those interviewed for this section of the report, Smart Grid interoperability standards must be flexible in dealing with existing equipment in order to prevent systems or technologies purchased today from unnecessarily becoming obsolete tomorrow. Keeping the standards flexible and appropriately focused will ensure that utilities will purchase and deploy the most cost-effective technologies to implement the Smart Grid.

Unlike Many Participants in the SGIP Process and the Development of the Smart Grid, Electric Utilities are Regulated Entities and Recoup Their Investment Through Cost Recovery Granted by State Regulators

Another major differentiating attribute is that utilities are the only regulated entities participating in the modernization and transformation of the electric grid. As mentioned above, as the primary investors in the grid, electric utilities have a different model when it comes to cost recovery. As regulated entities, electric utilities must weigh capital investment decisions, including those that may be influenced or determined by "approved" or "accepted" industry standards, against the likelihood of regulatory approval of the investment. Without the guarantee of regulatory approval, utilities need to approach these investment decisions, including what standards should be used, very carefully as they balance the overall financial risks and benefits to their customers.

The Introduction of Smart Grid Interoperability Standards Has the Potential to Transform the Electric Industry and the Fundamental Electric Utility Business Model

Finally, it is recognized that any interoperability standards that are identified, developed, and eventually introduced into the electric grid on a mass scale will have the real potential to significantly impact utility business models. These impacts will be felt in utility company operations, bulk system and distribution system reliability, cost effectiveness due to significant smart grid investments, cost recovery, legacy systems/obsolescence, mitigation of stranded costs, and operational changes in almost every aspect of the grid.

Overview

The following are the overarching themes that emerged from the interviews. In general, these themes are consistent with what utility stakeholders have stated in various industry forums and filings with NIST and the Federal Energy Regulatory Commission (FERC).

- *Interoperability standards greatly impact utility business models with respect to operations, reliability, and cost effectiveness; thus, utilities should be appropriately represented in the SGIP process due to significant Smart Grid investments, cost recovery, legacy systems/obsolescence, stranded costs, and involvement/responsibilities in almost all aspects of the grid.*

- *Greater satisfaction was expressed with the current SGIP process along with appreciation of NIST's increased openness to utility concerns following the FERC technical conference held in January 2011. Outreach and dialogue with policy-makers need to continue at all levels.*

- *There is a need to position interoperability standards "on the radar screen" of utilities and regulators to get them more engaged in the SGIP process, because interoperability standards may change and because keeping the standards voluntary is critical. There is still risk of future compliance requirements and enforcement guidelines.*

- *There is an urgent need for a formal communication, outreach, and education program to solicit greater participation of key utility and regulatory stakeholders; the SGIP's Communication, Marketing, and Education (CME) Working Group should be encouraged to expand its role and to develop a comprehensive marketing plan.*

- *Prioritization of standards work and the consolidation of competing industry forums for utility engagement are even more critical due to limited resources. For example, there is a need to prioritize priority action plans (PAPs), and to focus first on those that best suit established utility value propositions. The current pace of PAP activity is unfocused and overwhelming for the stakeholders—both utilities and regulators—responsible for investing in them.*

- *NIST should ensure that the pace of standards identification, development, and stakeholder acceptance allows utilities and regulators to make a measured and thoughtful analysis of the impact of these standards; the focus should be on quality and not on getting the job done as quickly as possible.*

- *Reliability and implementation reviews are critical; there is a need for the establishment of a standing Implementation and Reliability Committee (IRC) in the SGIP process that would operate in the same manner as the existing SGIP standing committees, consisting of the appropriate utility and regulator representatives, with the opportunity to provide direct transmission and distribution expertise into the SGIP process.*

- *There is a need to consolidate industry cyber activities along with a clearer definition and understanding of the cybersecurity standards and goals for utilities to engage more fully.*

- *An uneven state regulatory landscape regarding Smart Grid is a barrier, and utilities and their public policy and advocacy representatives need to perform outreach to the states for support through the National Association of Regulatory Utility Commissioners (NARUC); FERC-NARUC Collaborative is considered a good forum for this outreach.*

- *Many utility stakeholder interviewees strongly approved of FERC's decision in terminating the standards docket and encouraging participation in the SGIP process; they agree that FERC's role should continue to be minimal and limited to guidance to industry, NIST, and NARUC, with regulatory action only "if necessary" while deferring to the marketplace for standards development.*

Interoperability Standards: The Value Proposition

The benefits of the Smart Grid are well articulated in the White House report, "A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future." Standards ensure today's investment will be valuable tomorrow, act as a catalyst for innovation, enable consumer choice, keep prices low, highlight best practices, and help to open markets. During the interviews, these themes were echoed by the participants. They emphasized that standards directly and indirectly promote economies of scale among manufacturers, determine how to implement policy directives, establish metrics for the testing and certification of products, and establish minimum quality specifications. In addition, standards facilitate the use of multiple technologies and the interchangeability of products developed by different manufacturers. In order to implement the Smart Grid efficiently and effectively, it is important that products be tested by manufacturers, independent laboratories, and utilities to ensure that they are interoperable and cyber secure.

In dealing with Interoperability standards, the electric power industry has been confronted with unique challenges. In its simplest form, the Smart Grid is the merging of the traditional systems (generation, transmission, distribution, and metering) with advanced communication systems (internet, wireless, fiber optics, cell phones) and information technology systems (Advanced Meter Infrastructure (AMI), Outage Management Systems (OMS), Distribution Automation (DA)).

Smart Grid = Utility Systems + Advanced Communications and Information Technology Systems

The implementation of the Smart Grid requires that utilities take a more active role in the identification and development of interoperability standards while at the same time evaluating

the impact of potential Smart Grid technologies on their systems and performing the necessary due diligence required by their respective regulatory bodies.

It is imperative that the utility industry be involved in the identification and development of interoperability standards in order to minimize the impact of stranded costs and to manage how they deal with the potential for equipment obsolescence. Interoperability standards must be flexible in dealing with existing technologies in order to prevent systems or equipment purchased today from unnecessarily becoming obsolete tomorrow. It is important that interoperability standards remain flexible as well as focused on the appropriate layer of the electric power system. For example, the information model-layer standards need to define the "what" or define the functionality, and the technology-layer standards need to define "how" the technology is used. Keeping the standards flexible and appropriately focused will ensure that only the most cost-effective technologies are utilized to implement the Smart Grid.

Challenges: Utility and Regulatory Stakeholder Participation in the SGIP Process

Prioritization of Standards, Processes, and Forums are Necessary

The most predominant finding of this committee is that utilities and regulators are not adequately participating in the SGIP process. The major roadblock keeping utilities and regulators from participating more fully in the SGIP process is lack of resources. The utility industry has been and is still involved in the identification and development process of standards that directly impact their business operations. The interview participants felt that there was a lack of prioritization with respect to the interoperability standards in the SGIP process, along with a lack of delineation of roles of various stakeholder groups. The overall pace of standards development is overwhelming for utilities and regulators. Equipment vendors, on the other hand, can focus on one specific business area in the development of standards. Thus, while the utilities are engaged, they are spread thin and do not have the resources or personnel to engage and/or sustain their engagement in multiple standard processes and forums across the industry. Therefore, it was universally felt that there was a need to leverage the existing information along with streamlining and consolidating existing processes. PAP activities should be prioritized and standards releases should be scheduled based on the value propositions deemed most important by utilities and regulators.

Need for Consistent State Regulatory Support for Smart Grid Standards Development

State commissions may not fully appreciate the value of utility participation in the standards identification and development process. On the other hand, lack of support from local public utility commissions (PUCs) to participate in interoperability standards identification and development is considered a concern by many utilities. The utilities have to submit their plans for deployment of Smart Grid technology to their state PUCs for approval and demonstrate to PUCs how the Smart Grid will realize measurable improvements in service and eventual operating cost savings. Lack of PUC understanding of the Smart Grid issues is a substantial hurdle for any utilities that choose to participate in the process because of concerns of stranded investments and cost recovery. The dialogue between the utilities and the state

regulators needs to increase along with collaboration between the utilities and state regulators to ensure cost recovery for these beneficial/needed investments.

Reliability and Implementation Reviews of Interoperability Standards are Critical

There is a gap in terms of reliability and implementation reviews within the SGIP. The implementation of the Smart Grid investments and the development of interoperability standards require that the implication of the standards be evaluated and measured from a holistic perspective. There needs to be a formal review of these interoperability standards with respect to the reliability and implementation readiness by industry representatives who have the primary responsibility for safety, operation, and reliability of the grid. It should be noted that by "reliability," the interviewees are referring to the ability to keep the lights on and the electrons flowing, the utility definition of reliability, and not the systems architecture definition of reliability (information communication technology systems to systems). "Implementation" refers to the due diligence in evaluating the impact of changes to utility operation and the economic impact including stranded costs and obsolescence of equipment.

The focus of these reviews should be on reliability considerations, implementation readiness, cyber impacts, stranded costs, and impacts on legacy systems of the utilities. This gap in terms of reliability and utility-implementation reviews and associated documentation of their conclusions and analyses needs to be addressed by strategically modifying the SGIP process by the addition of a single, explicitly populated standing committee that would provide the critical stakeholders who are charged with maintaining and promoting the reliable and efficient operation of the electric grid—electric power system owners, operators, and regulators—with a means to identify and address concerns regarding the potential impacts to reliability and business operations.

Need for Balanced Voting in the SGIP Process

A major issue raised by the utility interviewees as well as other stakeholders outside of the utility sector is the need for more balanced voting within the SGIP process. Utility interviewees generally expressed that the SGIP process has a problem with regards to an imbalanced voting process. It was felt that while there is diversity in participation in the SGIP, stakeholder voting is not properly balanced because investor-owned and publicly-owned utilities, as well as state and local regulators, are particularly underrepresented in the process. For example, investor-owned and publicly-owned utilities collectively are only designated one of the 25 SGIP Governing Board seats. Similarly, state and local regulators are also only designated one SGIP Governing Board seat—the same number, for example, as provided to venture capitalists. Under current SGIP/Program Management Office (PMO) rules, SGIP approval may be based solely on a 75% (or 50% depending on the topic) affirmative vote of the SGIP. Furthermore, participants from vendor and vendor-related categories constitute approximately 50% of the SGIP participating members. However, if every investor-owned and publicly-owned utility and state and local regulator who is a participating member in the SGIP voted against approval, consensus could still be achieved by the SGIP by virtue of the fact that investor-owned and publicly-owned utilities and state and local regulators collectively only constitute approximately 10% of the SGIP participating membership. In general, it was felt that the utility voice needs to

be proportional with respect to the market exposure, large investment, and impact that the utility industry will bear.

Need to Continue the Focus on Transparency, Roles, and Responsibilities

The interviewees believe there has been a proactive effort to make the SGIP process accessible to all interested participants through web technologies and remote meeting access. Along with increasing inclusiveness, there is a need for continued focus on better transparency and definition of the roles and responsibilities of the various groups within the SGIP.

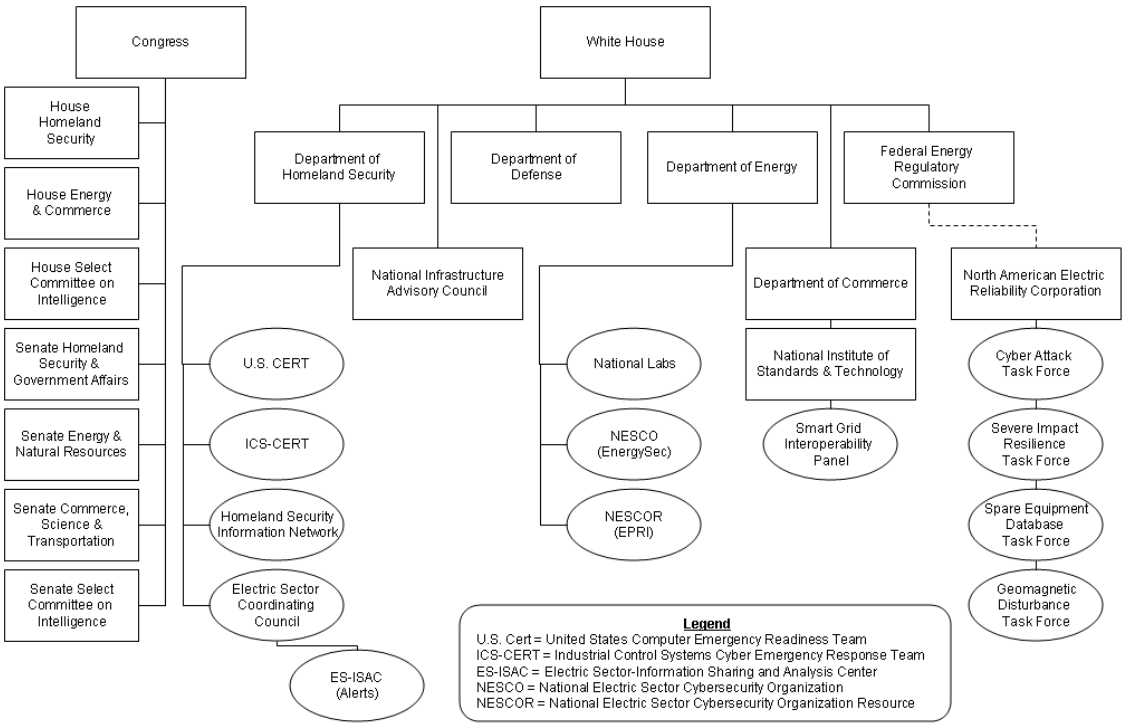
Overall, the SGIP needs to clearly define the roles and responsibilities of various groups within the SGIP as well as better explain to participants involved in those activities what is expected of them. It is extremely difficult for industry representatives to justify participation in an activity without understanding what is expected of them. For instance, although NIST created the Domain Expert Working Groups (DEWGs) prior to the creation of the SGIP, the function of the DEWGs is still widely unknown by SGIP participants.

In addition, NIST and the SGIP need to better clarify what each perceives the role of the newly created Catalog of Standards (CoS) to be. While NIST has statutory obligation, pursuant to the EISA 2007, to develop the Smart Grid Framework and Roadmap, it is not clear how the CoS integrates with this statutory obligation. This should be clearly, simply, and visually articulated in future releases of the NIST Smart Grid Interoperability Framework and Roadmap documents. NIST should ensure that it continues to select only standards that have been added to the CoS, thereby assuring they have completed the SGIP process life cycle, and they have fully documented stakeholder support. Transparency and inclusion must extend all the way through the NIST/SGIP process.

Coordination of Cybersecurity Activities

Another critical aspect of the ongoing process is cybersecurity. It was observed that there are far too many cybersecurity activities. The following graphic (Figure 1) illustrates the extent of the cybersecurity and critical infrastructure activities that are competing for utility and regulatory stakeholder representation. It should be noted that cybersecurity and critical infrastructure protection are different activities but both draw upon the same skill set from equipment vendors, utilities, and regulators.

Figure 1. Federal Cybersecurity Structure



Though engaged at all levels of activities related to cybersecurity, interviewees agreed that utility and regulatory stakeholders simply do not have the resources or "bandwidth" to more fully engage in all these activities to the extent that they need to be covered and to give them the level of effort that is required of them. These particular stakeholders are struggling to find the cybersecurity activities that provide the biggest return on investment. It was mentioned by the interview participants that a cybersecurity approach that is overly burdensome and academic will stifle innovation and will be counterproductive.

Urgent Need for a Communication Plan and Education and Outreach Efforts

The interview participants were very concerned about the threat of standards becoming mandatory. The lack of direction from FERC on what the adoption of the standards would mean, combined with the lack of state regulatory guidance and participation in the SGIP process, remains a major roadblock.

The importance of Smart Grid standards needs to be impressed upon the utilities, regulators, and consumers through a major communication and educational outreach so that they can understand the risk of non-engagement and non-compliance and understand the value of changes in pricing and delivery models.

There is a concern among the utility industry that the current voluntary nature of the interoperability standards could well change to a more prescriptive and mandatory compliance

regime along with enforcement guidelines and large financial penalties in much the same way that the North American Electric Reliability Corporation (NERC) changed by federal legislation from an informal, voluntary industry organization to facilitate coordination of the bulk power system in the United States and Canada to an Electric Reliability Organization (ERO).

Conclusion and Recommendations

Creation of an Implementation and Reliability Committee is Essential

The existing SGIP process and structure should be extended by creating a standing Implementation and Reliability Committee (IRC) with a defined number of voting members representing regulators as well as municipal, cooperative, and investor-owned utilities. The IRC would reside as a standing committee within the SGIP in addition to the current Smart Grid Architecture Committee (SGAC) and Smart Grid Testing and Certification Committee (SGTCC). The IRC would endeavor to provide a transparent and well-documented point of interoperability standards review from the regulatory and asset owner/operator perspective (regulators and those regulated) for identified and agreed-upon work products. The IRC would serve to inform the SGIP Governing Board and the SGIP, as well as industry and its regulators, of potential impacts of any standards/protocols under consideration. However, this review process would not stand as a prerequisite to the inclusion of any interoperability standard or protocol in the SGIP CoS; rather, it would serve to inform the SGIP Governing Board and the SGIP, as well as industry and its regulators, of potential impacts of any standards/protocols under consideration. The documentation developed by the IRC would be noted in the CoS, and the information would serve as a valuable tool and could be referenced by any of the CoS users. Accordingly, the leveraging and extending of existing mechanisms by the addition of this single standing committee would be an effective and efficient means of addressing the concerns of entities with direct involvement in the regulatory and operational environments.

Balanced Voting

The weight of the utilities' vote must be more proportional to the magnitude of the investment and market exposure that the implementation of the Smart Grid has on their business operations. There are several means by which a more balanced voting process can be achieved to avoid the disproportionate influence of any particular stakeholder group and its related interests and to prevent minority interests from being essentially ignored. For example, the SGIP approval requirements could be revised to include not only the currently required 75% (or 50%) approval of the SGIP members, but to also adopt a requirement—similar to that used by the North American Energy Standards Board (NAESB)—that approval also requires a meaningful level of consensus by each or within each of the various industry segments, such as also requiring a majority favorable vote from each of the 22 SGIP industry stakeholder categories. Utilities have indicated and strongly advocated a voting process similar to that of existing standards development organizations (SDOs), for incorporation into the SGIP process. The NAESB process was repeatedly cited as an example of a more balanced process and one that enables the utility industry voice to be more proportional to the market exposure than what currently exists in the SGIP process. As an alternative, each of the existing 22 SGIP stakeholder categories could be mapped into broader segments (such as Governmental and Consumers,

Power Producers/Traders, Technology, Utilities, and Vendors) and approval would require a majority favorable vote from each of the segments.

Greater State Participation

It is generally recognized that state regulatory agencies have significant resource challenges with respect to participation in the SGIP process; however, continued encouragement of the state regulatory agencies to participate in the SGIP is needed. In addition, the SGIP and NIST should strive to strengthen relationships and participation in NARUC and the FERC-NARUC Smart Response Collaborative. State Public Utility Commissions should be encouraged to be actively involved with NARUC and the NARUC Smart Grid activities. In addition, the work and perspective of those activities need to be incorporated into the SGIP. The utilities should also keep their states informed of Smart Grid developments and implementation issues and engage in a regular dialogue.

Coordination of Cybersecurity Activities

The high-level goals and objectives of the CSWG need to be understood by the participants and then communicated to all potential participants. While an enormous task, NIST and the CSWG should attempt to coordinate the cybersecurity activities of the various government and regulatory entities. There are numerous competing cybersecurity activities, and stakeholders, especially utilities, do not have the resources to cover all of them. For this reason, it is recommended that NIST and the CSWG along with other cybersecurity state, federal, and private sector entities/bodies work to coordinate their activities in order to reduce overlap and the number of activities in this area.

In conjunction with the coordination efforts, the CSWG needs to better educate utility representatives about the goals and objectives of the CSWG and to advertise the need for bringing more distribution system expertise into the CSWG.

Prioritize, Streamline, and Leverage Smart Grid Activities

NIST and the SGIP need to reach out to organizations in the Smart Grid ecosystem and work to prioritize and consolidate activities. There are too many organizations competing for the same stakeholder experts, and there are not enough resources to deploy sufficiently or effectively. The pace of PAP activity is especially burdensome and unmanageable for utilities and regulators who must cover ALL aspects of the SGIP PAP activity. The SGIP needs to continue to leverage the work of other groups' Smart Grid activities in much the same manner that NIST has previously done with utilizing the work of the Gridwise Alliance, Gridwise Architecture Council, and Electric Power Research Institute (EPRI) in development of the first NIST Interoperability Standards Roadmap and Framework document. Essentially, there should be an attempt to combine/converge industry activities/groups/dialogues, and the creation of more groups/activities/layers should only be done if absolutely necessary. PAP activities should be prioritized and standards releases should be scheduled based on the value propositions deemed most important by utilities and regulators.

NIST Should Continue to Encourage SGIP Involvement

NIST should continue to champion the efforts and work of the SGIP to international organizations and other federal and state regulators and continue to do more outreach.

It is recommended that NIST encourage and/or work with the SGIP to:

- Develop a long-range funding mechanism for the SGIP
- Develop additional education material, including webinars that explain the organization and structure of the SGIP and what the inclusion of a standard into the CoS really means
- Focus on R&D related to cybersecurity and focus on the real-world application of certification and conformance in the industry

Development of an Educational Campaign and Outreach for Utilities and State Participation

The purpose of this communication plan should be to get key stakeholders, including but not limited to utilities, regulators, and consumers, involved in the standards process, and to recognize the value of new business models enabled by the SGIP and resulting standards. Suggestions from the interviewees included enhancing the role of SGIP's Communication, Marketing, and Education (CME) Work Group and NIST in developing a marketing campaign. The marketing campaign needs to clarify and highlight the importance of these interoperability standards and the business and consumer value they bring. The SGIP process is complex and needs to be simplified to demonstrate how it impacts business models to deliver value. There are mixed reactions among the states about the Smart Grid. Not all of the public utility commissions (PUCs) understand the value of interoperability standards and participating in the SGIP. Obsolescence of legacy equipment and cost recovery is a very real concern for utilities and state regulators. How this issue is handled within the SGIP process with respect to the development of standards has the potential to impact utility bottom lines, so education and outreach is a must.

Finally, NIST should be commended for its efforts. The interviewees were virtually unanimous in stating that the SGIP process is going well and that earlier concerns, as expressed in the FERC January 31, 2011 Technical Conference, have been abated to a great extent. All were impressed with the willingness of George Arnold and his team at NIST to listen to the concerns of all stakeholders and address them. The participants were very appreciative that NIST is actively working with the utility industry to refine the SGIP processes to facilitate increased stakeholder participation in addressing reliability, cybersecurity, and implementation issues.

Section Two: Long-term Evolution of the U.S. Smart Grid Effort

Introduction

The challenge for the SGAC Subcommittee Three, which focused its efforts on long-term gaps, was to define the governance structures and working relationship between the U.S. Department of Energy (DOE), the National Institute of Standards and Technology (NIST), and the Smart Grid Interoperability Panel (SGIP) relative to their roles in Smart Grid and the vision of the grid in 2015 and beyond. Subcommittee Three focused on a future vision of the marketplace that was agreed upon by its members. It was decided to focus interviews on both NIST staff involved in the SGIP process. From there, Subcommittee Three examined the possible roles and responsibilities for both NIST and the SGIP going forward. Individual Subcommittee Three members participating in this process represented the Public Utility, Power Equipment, Standard Development Organization (SDO), and Information, Communications, and Telecommunications (ICT) stakeholder categories. With this in mind, the critical concepts identified by Subcommittee Three on its December 10, 2010 conference call included:

1. The long-term planning range for the purpose of this working group is five years and beyond.

2. It is necessary to consider how the current structures in both the government and industry will evolve.
    a. What is the NIST role in this structure and how might NIST need to organize for its evolving role by 2015 and beyond?
    b. What is the industry role in this structure?
    c. How do other government agencies fit?

3. How can the process of identifying standards and their supporting technologies transition from the current government-funded, industry-led NIST/SGIP initiative to being solely an industry function with government input?

4. What does a mature SGIP program look like as a component of the long-term vision?

In order to organize this discussion, the working group needed to create a common vision of the future of the Smart Grid in the United States. For readers who are interested, these assumptions can be found in Appendices A and B of Section Three.

Because the Energy Independence and Security Act of 2007 is public law (PL 110-140, EISA 2007), the various federal agencies named in the Act necessarily retain their responsibilities for Smart Grid. A map of these responsibilities is included in Figure 2. Within DOE, the EISA designated the Office of Electricity (DOE-OE) as the lead agency. To support this role, in 2009 OE identified Eric Lightner and Chris Irwin as the leads for Smart Grid. In the absence of any

EISA-specified lead designation at FERC, the Office of Energy Policy and Innovation under Deputy Director Jamie Simler has been identified as the lead agent for Smart Grid.

To support NIST's responsibilities, in 2009 Dr. George Arnold was identified to be the National Coordinator for Smart Grid Interoperability. Under the current operating structure, Dr. Arnold leads a team of 20 to 30 individuals who support his office and the program:

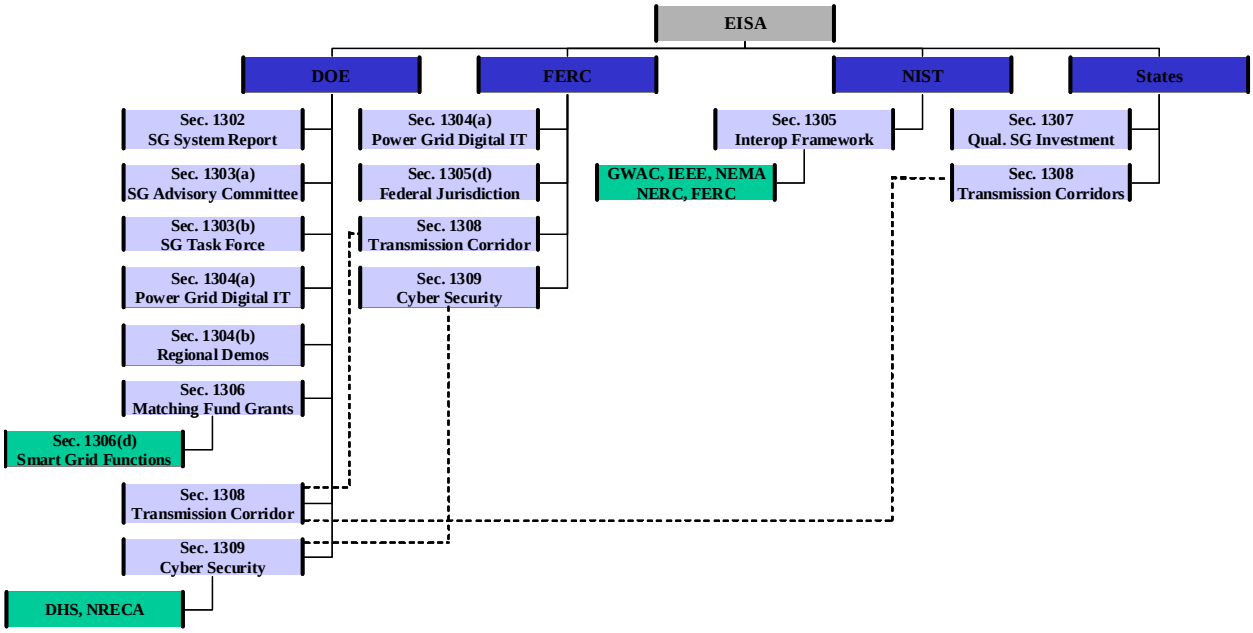
- *Engineering Laboratory*
    - Smart Grid Program Office
        - Overall Program Coordination
        - Testing and Certification
        - Standards Coordination
        - Research Coordination
        - Advisory Committee Support
        - International Engagement
    - Building Automation and Control
    - Data Modeling and Architectures

- *Physical Measurement Lab*
    - Renewable and Storage
    - Power Electronics
    - Metering
    - Phasor Measurement
    - Electromagnetics

- *Information Technologies*
    - Computer Security
    - Networking and Architectures

- *Office of the Director*
    - Stakeholder Engagement
    - Public and Business Affairs
    - Contracts Management
    - General Counsel
    - Congressional & Legislative Affairs

Figure 2. Map of Responsibilities under EISA



NIST-2015

It is widely agreed by the working group that in terms of an organizational structure, a "no change" scenario will not be sustainable by NIST in the years 2015 and beyond. To support an evolving mission as the NIST role in Smart Grid changes, the organization will need to develop some bench strength with greater detailed expertise in terms of both the technological and administrative functions necessary to support Smart Grid. It is therefore necessary to decompose the functions and activities that NIST will be expected to support in 2015 in order to identify the constituent elements that are required by its staff.

Functions and Activities

As stated above, NIST has responsibilities under EISA that it must support Smart Grid. A few of the specific mentions of NIST in EISA include:

- Contribute to the Dept. of Energy Smart Grid Systems Report (EISA §1302)
- Possibly support the Smart Grid Advisory Committee (EISA §1303(a))
- Provide a staff representative to the Smart Grid Task Force (EISA §1303(b))
- Maintain the Interoperability Framework (EISA §1305)
- Support/advise/counsel FERC on rulemaking for Smart Grid Standards for Interoperability in Federal Jurisdiction (EISA §1305(d))

Additional functions as envisioned by Working Group Three that are either implied by EISA or the NIST mission statement include:

- Provide advice and counsel on Smart Grid to:
  - U.S. Congress
  - Other federal agencies
  - State energy authorities and utility commissions

- Provide input to other federal agencies on cybersecurity issues
  - Develop a cybersecurity response plan

- Interface with state utility and public service commissions

- Analyze international Smart Grid policies, activities, and technical efforts

- Opine on standards relative to National Technology Transfer and Advancement Act (NTTAA) and the Office of Management and Budget (OMB) Circular A-119

- Develop test methodologies to measure Smart Grid performance
  - Ensure consistency across the applications of the SGIP Testing and Certification Committee's Interoperability Process Reference Manual (IPRM)
  - Provide guidance and review of certification bodies in accordance with the National Voluntary Laboratory Accreditation Program (NAVLAP)

- Coordinate with other federal agencies on cybersecurity

- Provide laboratory service and guidance on electromagnetic compatibility and interference issues

- Provide input to the DOE Smart Grid Clearinghouse

A major discussion item that was part of the FERC Technical Conference on January 31, 2011 was over the nature of what it means for a Smart Grid standard to be "adopted" by FERC. However, the disconnect between NIST, FERC, and the Conference panelists highlights an operational need relative to NIST's role in the regulatory process. The form of the NIST suggestion for the five families of standards that were discussed at the conference was merely a letter naming the standards with a brief description of their purpose in the Smart Grid. It seems obvious in the aftermath that some additional context needs to be supplied with any future recommendation.

The regulatory process is not binary, which is to say that it is not about the mere presence of a standard (as suggested by the form of the NIST letter to FERC) in a regulation, but much more about the appropriate time, place, and method of employment for that standard. There is no doubt that in the future, these notions need to be part of any recommendation to FERC. To

manage this responsibility, the NIST organizational structure needs to be prepared to support the process of developing more detailed descriptions.

Regarding the National Technology Transfer and Advancement Act (NTTAA) as encoded by the Office of Management and Budget (OMB Circular A-119), federal agencies are directed to use consensus standards, developed by consensus standards bodies, and to encourage participation in voluntary consensus standards bodies when compatible with agency missions, authorities, etc. The Act further directs NIST to coordinate federal standards and conformity assessment activities with those of the private sector.

On a related note, FERC citations following the release of their Smart Grid Policy Statement in June of 2009 note the responsibility they have relative to advancing regulations that are compatible with the NTTAA. Therefore, it appears that by extension, NIST will be obligated to support FERC (and also likely the Dept. of Energy and Nuclear Regulatory Commission) if they desire to implement any Smart Grid standards in regulation. This is not only important to note in terms of NIST staffing, but there are also a variety of legal implications that will come into play.

In a similar vein, the implications associated with Section 1309 of EISA, *Cybersecurity*, fall jointly on the Dept. of Energy and FERC. In response to the cybersecurity challenge that Smart Grid faces, NIST formed the Cybersecurity Coordinating Task Group, or CSCTG, at about the same time they were establishing the SGIP. Eventually this group was reorganized as the Cybersecurity Working Group (CSWG) under the SGIP with the following goals:

> *The primary goal is to develop an overall cybersecurity strategy for the Smart Grid that includes a risk mitigation strategy to ensure interoperability of solutions across different domains/components of the infrastructure. The cybersecurity strategy needs to address prevention, detection, response, and recovery. Implementation of a cybersecurity strategy requires the definition and implementation of an overall cybersecurity risk assessment process for the Smart Grid.*

The unique thing about the CSWG, and the CSCTG before it under the SGIP, is that it is headed by a full-time member of the NIST staff. With the lofty expectations for the Smart Grid and the volumes of communications protocols and technologies that are going to be required to achieve them, it is likely that cybersecurity will play a major role in NIST for years to come.
A complaint about the CSWG that has been highlighted by a number of sources, including the panelists at the FERC January 31, 2011 Technical Conference, is that NIST Interagency Report (NISTIR) 7628, *Guidelines for Smart Grid Cyber Security*, is much more of a philosophical document than a handbook for achieving a secure operating environment. The challenge is to parse each of the three volumes in NISTIR 7628 in order to create a set of actionable recommendations to implement cybersecurity on a consistent basis. This needs to apply for like-products from different vendors as well as across the various utility company operations.

As one FERC panelist stated, the security problem is not intractable, and we must strive to develop "an overriding security addendum that must be adopted along with the standards."

However, it is one thing to go through the rigor of identifying the piece-parts that formulate a cybersecurity strategy for the grid, but something altogether different to establish the appropriate response protocol in the event of a cyber emergency. To date, this Subcommittee is unaware of any agency within the federal government (with the possible exception of some compartmentalized functions within the Department of Homeland Security) that is addressing the possible responses to a national cyber emergency. The expectation is that NIST should assist DHS in defining the federal response to national cyber emergencies.

Conclusion and Recommendations

The challenges as the Smart Grid evolves over the next five-to-ten years mandate a change in both the form and structure of the NIST Smart Grid business unit and the SGIP. A lot of human capital will need to exist if NIST is to adequately support the regulatory process in light of both the kinds and volume of information necessary for the seamless adoption of a technical standard in regulation. This includes specific use cases that describe the time, place, and method of employment for the standard in regulation, the implications based on the NTTAA, and any associated cybersecurity concerns. NIST must also be prepared to support state and federal regulators after adoption as challenges are issued through both the legal or regulatory processes. NIST must also consider a staffing plan to support the responsibilities as described under "Staffing" below.

Also, if NIST is going to be one of the key federal players in Smart Grid, it needs to assist DHS to develop some form of response capability in the event of an electric grid disaster—whether physical or cyber. This needs to be done in collaboration with other federal agencies, and should follow the model of the *National Diversity Assurance Initiative (NDAI)* as developed by the Federal Reserve Board. According to their website, the NDAI:

> *"...resulted from concerns that a widespread disruption of the telecommunications infrastructure that was not quickly recovered would bring the nation's wholesale financial system to a halt. The susceptibility of the telecommunications infrastructure to disruption was underscored by the September 11 attacks. The Federal Reserve, in conjunction with other federal and private sector entities, has worked to identify business continuity objectives and sound practices aimed at strengthening the resilience of the U.S. financial system."*

This plan should form a template for emergency response for both the physical/electrical and command and control functions: how to find, isolate, and remediate the breach; how to manage command and control between utility providers; how to coordinate with other federal agencies including DHS, FEMA, FCC, DOD, and DOE; how to collaborate with state, local, and

municipal authorities during the remediation process; and how to marshal industry resources to supply patches for the vulnerabilities and prevent similar occurrences in the future.

This plan should include conducting a demonstration program, possibly aligned with the military Base Realignment and Closing (BRAC) strategy. The focus for this demonstration should be on reliability and stability, not the consumer, and it should include features like microgrid(s), renewables, storage, and distributed generation.

A similar evolution needs to take place in the SGIP. To begin, in order to sustain its existence, the SGIP will need to become a registered entity, separate and distinct from NIST. This would require the development of some form of business plan. It is understood by this Subcommittee that the contract for the current SGIP administrator required some form of recommendation to perpetuate the SGIP in the absence of government funding. It will be very worthwhile for the NIST SGAC to review this report.

Also, to relieve the tensions that currently exist, the SGIP needs to get greater involvement from utility companies and revamp its voting procedures to ensure consensus. While unanimity is not currently required, some shared form of consensus should exist across the stakeholder categories. As it currently exists, 100% of the utility companies could vote against some issue in the SGIP, but it could still carry the day because of the current majority voting procedures. Unanimous consent against an issue in a designated voting bloc should serve as a trigger and cause the SGIP Leadership to re-evaluate its merit and/or modify the approach.

The SGIP should push to ensure that regulations are in place so that costs incurred by utility companies to support the SGIP are recoverable at both the federal and state levels.

Staffing

Given the functions and responsibilities as described above for NIST, the following staff functions would seem to be necessary in 2015 and beyond:

- National Coordinator for Smart Grid
    - Also staffs the SG Task Force in EISA §1303(b)

- Coordinator(s) for Regulatory Affairs
    - Federal
    - State

- Required Technical Expertise
    - Generation
    - Transmission and Distribution (T&D)
    - Consumer Technologies (Commercial, Industrial, Residential)
    - Cybersecurity
    - Privacy
    - Metering

    - Communications

- Legal Counsel
- Interagency liaisons with DHS, DOE, FCC, DOD, FEMA, etc.
- International
    - Collaboration with peer organizations in foreign counties, both public and private

Again, this would seem to meet the agency's needs in terms of the three primary functions they will continue to face: identification and implementation of appropriate technical standards; support for federal and state policymakers; and support for federal and state regulators.

Section Three: Recommendations on NIST Smart Grid Research Activities

Introduction

This section of the report represents the work of SGAC Subcommittee Four focused on the various research challenges and recommendations. Specifically, this section summarizes the perspectives based on 15 interviews of stakeholders across the Smart Grid regarding NIST Smart Grid research activities. Interviewees for this section of the report represented the following areas of the Smart Grid ecosystem: electric utilities, technology providers / system integrators, state and federal regulators, and Department of Energy national laboratory staff. Specific recommendations on research areas are included.

Overview

The following are the overarching themes that emerged from the interviews:

- *Generally, the private sector should be the primary vehicle for applied Smart Grid research. Universities, research institutes, and national laboratories do the basic research. NIST Smart Grid research and development should focus on areas where the organization has core competency and expertise, namely: standards development, metrology, cybersecurity, and testing and certification.*

- *NIST should be selective in the areas that it tries to address, and focus on things that require a common, continuing, unbiased oversight and will result in a common set of standards for the community. In short, it was felt that this activity is good and should receive resources as deemed appropriate by NIST.*

- *Development of cybersecurity standards and other related research needs to be a coordinated effort between SGIP, utilities, vendors, and regulators so as to reduce the confusion and complexity about implementing standards.*

- *There is a need to sort out the large amount of research sponsored and/or done by various federal agencies (e.g., NIST, DOE, DHS) to remove duplicative work, and to get the useful results of the research to utilities and vendors for further development and commercialization.*

- *Rigorous and transparent processes and techniques for interoperability testing and certification of individual Smart Grid products as well as integrated systems are important.*

- *NIST technical experts in different Smart Grid domains should interact more with their counterparts at utilities to better understand how the standards affect or could affect utility operations in terms of grid reliability, security, and business processes.*

- *Utilities need metrics to support the deployment of the Smart Grid. There is a need for a systemic view of the benefit to the customer from Smart Grid improvements to the grid. The industry as a whole has to quantify the financial benefits in a way that is convincing to the customers, regulators, and utility leaders. Without clear metrics to the customer and the business, people cannot judge the benefits of the various programs.*

Research-related Gaps, Activities, and NIST's Role

Collaboration on Cybersecurity

There needs to be more collaboration on different research efforts being conducted. The role of NIST as a keeper of security standards for unclassified work for the U.S. government could somehow be exploited. NIST cybersecurity experts should continue to stay connected with the Smart Grid security work. NIST has a great opportunity to drive our security program.

Smart Grid Metrics

Utilities need metrics to support the deployment of the Smart Grid. For example, metrics for control of the power system considering the two-way flow of energy are needed. While this may not yet be a major issue for utilities, interviewees anticipate that it will. Another key question is how to characterize and quantify the operational risks in the Smart Grid in terms of reliability, interoperability, and cybersecurity? There is growing interest for a systemic view of the benefit to the customer from Smart Grid improvements to the grid. The industry as a whole has to be able to quantify both operational risks and financial benefits in a way that is convincing to the customers, regulators, and utility leaders. Without clear metrics to the customer, it will be difficult to evaluate the benefits of the various programs. For example, what metrics can be used to measure the impact of items like Plug-in Hybrid Electric Vehicle and distributed generation and demand reduction that are both understandable and believable to all the stakeholders from the regulators to the customers? Methods must be developed to take the benefits from pilot projects (e.g., feeder reliability improvements) and translate them in a meaningful way to the system-wide deployment. The regulators are having a difficult time judging the benefits of the Smart Grid. Research to improve the metrics for operational performance of the Smart Grid could address this issue. In addition, due to potential vulnerabilities facing the Smart Grid from cyber attacks, security metrics will also be needed.

Facilitator of Research around Standards Development, Security, and Metrology

NIST should focus its Smart Grid research priorities around the subjects related to standards development, cybersecurity, and metrology. NIST should avoid duplicating the research activities in the domains of the Smart Grid already being conducted by EPRI, national laboratories, and universities as well as by the private sector. However, NIST should facilitate greater collaboration in Smart Grid research. In such a role NIST could provide input to the research priorities of these organizations to ensure that adequate emphasis is put on the topics that are relevant for standards developments, interoperability, and cybersecurity.

Modeling and Metrology

There is a strong relationship between modeling, calibration, and measurement. Accurately modeling the Smart Grid at both the system and device levels is an important aspect of achieving interoperability. Analytical models must describe physical phenomena which occur in the Smart Grid. The models also determine the data and information that are exchanged between systems, devices, etc., for both real-time operations and planning. While there are various modeling efforts in the industry, more research is needed to validate and enhance these existing models as well as develop newer models. This will be all the more necessary as the Smart Grid continues to grow and evolve. New kinds of devices will be constantly added and different operational procedures implemented by utilities; to create this "system-of-systems" will become even more complex.

Testing, Calibration, and Certification

NIST could be involved beneficially in issues related to the testing, calibration, and certification of Smart Grid components. NIST has already demonstrated this capability as part of its efforts on Phasor Measurement Unit testing. However, for those cases where NIST may not want to be involved in testing itself, it could recommend testing requirements related to cybersecurity, functionality, interoperability, and other issues. NIST's role could be to coordinate these activities that may take place at other labs. Another related role would be to develop test processes for the actual testing itself, or for NIST to physically test the equipment that is used by others in the test process. In this way, NIST could ensure that tests conducted at different test facilities would be comparable to one another.

Key Recommendations

NIST Research Activities

The key research areas for NIST should be interoperability, cybersecurity, testing and certification, metrics for interoperability, vulnerability, resilience, and other properties of complex systems such as the emerging Smart Grid.

Facilitator of Multi-Stakeholder Smart Grid Research Collaboration

NIST should take advantage of the multi-stakeholder SGIP and play the role as the convener of workshops on Smart Grid research in order to ensure that the focus of these entities' research agenda supports the activities to develop interoperability and other Smart Grid standards.

Accreditation of Testing and Certification Laboratories

NIST should conduct research into the development of processes and procedures to provide accreditation to independent laboratories that will be authorized to test and certify that products and systems comply with the Smart Grid interoperability and cybersecurity standards. NIST should also conduct research about the lessons learned from other industries that have developed certification and compliance regimes, and should research how the findings can be adapted for the Smart Grid. As both Smart Grid and interoperability and cybersecurity standards are constantly evolving, NIST should conduct research to continuously improve the

accreditation processes for the independent laboratories. NIST research activities in this area should be funded in part by fees paid by laboratories and by the federal government.

Collaboration with Utilities and Private Sector

NIST should invite and promote strong collaboration with utilities and the private sector on research into metrics for interoperability, cybersecurity, and other properties of the Smart Grid. Such collaboration could lead to more jointly funded R&D efforts, and also improve the support for NIST activities by Congress.

Continue Research in Electric Power Metrology

NIST should conduct research to determine the metrology requirements for Smart Grid devices, research that aims to reduce the number of interfaces between different devices. NIST should build upon the work it has already started on electric power metrology for the Smart Grid. Over the coming decades, as the Smart Grid continues to evolve and new sensors and actuators are developed, there will be a need to ensure that the measurements are accurate and that the controls are acting, and at the same time satisfying, the standards for interoperability. NIST should continue to conduct power grid metrology research to also include identification of new kinds of quantities that characterize the system level behavior of the Smart Grid.

Smart Grid Modeling

NIST should conduct research to create a framework for determining the requirements for modeling the Smart Grid at the system level. In the coming decades as the Smart Grid continues to evolve with more advanced devices, with embedded sensors being added, and more interconnectivity between systems as well as devices, accurate modeling will be key to achieving interoperability. As demand response and intelligent buildings are expected to play bigger roles in the Smart Grid, modeling and the development of appropriate standards for communication to support these new resources connected to the grid will be critical. NIST should continue its research and development in intelligent building integration with the Smart Grid.

Appendices

Appendix A: Smart Grid 2015 – A Baseline Narrative

By 2015, it is expected that the pilots and demonstrations that were initiated and funded as part of the American Recovery and Reinvestment Act of 2009 (ARRA, or The Stimulus Bill) will be complete. As the fifth year of the national Smart Grid effort begins, a significant amount of deployment based on the results of those demonstrations will have taken place. As a result, electrical grid operators will have a substantial deployment of smart gear, largely centered on those applications that will most directly benefit the utility company. That is to say that items that do not necessarily have a consumer component, such as substation automation, outage management, and supervisory control systems, will progress more rapidly and consistently than the technologies on the consumer side of the meter.

Suburban Areas Will Have More Smart Grid Technology

Suburban areas will contain significantly more Smart Grid technology than either rural or urban areas, because they will have been "built smart" as population growth causes the number of residents in the suburbs to continue to expand. Deployment of smart technologies was more necessary in suburbia to support the electrical vehicle market. In the period between 2010 and 2015, electric vehicles (EVs) tended to thrive in the suburbs, because the residents not only have the disposable income to purchase the vehicles, but their lifestyle is also able to accommodate the vehicles' limitations in terms of range-between-charge requirements.

Urban Areas Will Lag; Rural Electric Cooperatives Will Be A "Mixed Bag"

In 2015, deployment of Smart Grid technology lags in the urban areas, because much of the existing legacy gear still has usable life and has not been fully depreciated. At the same time, rural areas and electric cooperatives offer a mixed bag of Smart Grid capabilities. Some of these utilities lag because there is little new construction and the revenue base simply isn't there to fund the wholesale replacement of their existing operational gear. Other co-ops have a much more advanced implementation, because they realized early on that Smart Grid was critical to their business case in terms of sustaining their operations.

Smart Grid Standards 80% Complete

In 2015, we expect the Smart Grid landscape to be fairly well-developed in terms of standards, somewhere in the 80% complete range. It is impossible to know how many standards it will take, but by saying the task is 80% complete you would expect that the list will only grow by another 20%. By this time, the conceptual architectures (and corresponding standards) for the Smart Grid will be fairly well-baked and accepted by a consensus of the electrical supply chain. The majority of the standards work beyond 2015 will center on the home market and corresponding grid-side ancillary services in order to support higher functionality inside the home. International standardization is also fairly stable as the important issues relative to Smart Grid operations are harmonized between the Americas, Europe, and Asia.

No Major Legislation; Focus on Security and Privacy

The legislative front is similarly quiet in 2015. As cited earlier, most of the major federal legislative initiatives for Smart Grid will have been completed, funded, etc. However, there may be some loose ends that need to be cleaned up as part of the ongoing energy policy process, but there are no major smart grid standalone initiatives (like EPAct-2005, EISA 2007, or ARRA 2008) on the horizon. Of all of the issues being addressed, security and privacy continue to be relatively thorny, which is where the majority of the legislative effort will be focused.

In contrast, the regulatory environment of 2015 is likely to remain somewhat unsettled. Policy conflicts between federal and state authorities continue to bristle and be challenged in terms of the separation of authority. Lingering effects from regulatory activities related to energy efficiency, emission standards, renewable electricity standards (RES), and carbon production and offsets earlier in the decade will continue to produce concerns for the industry. A variety of lawsuits will have been initiated as state utility commissions seek broader jurisdiction.

Appendix B: Market Drivers

When you consider the adoption of the Smart Grid, the overall assumption is that the United States and the other developed nations of the world are on the path to making it a reality. Therefore, the role of the market drivers in this scenario will either be to accelerate or inhibit the arrival of individual components associated with the Smart Grid. This paper makes no assumption about the status of these drivers, other than to comment on their possible impact for the deployment of smart technologies.

The impact of the global economy will continue to be a significant driver for Smart Grid deployment in 2015. Whereas the seeds for deployment of the technologies in the United States were sewn as a result of the $4.5 billion Smart Grid Investment Grant program in the American Reinvestment and Recovery Act, the speed of propagation in 2015 and beyond will benefit from a robust U.S. and global economy. Because every aspect of the Smart Grid comes with a price tag, utilities will rely on public utility commission approval of rate cases in order to deploy smart equipment. Changes in utility rates are obviously more palatable under favorable economic conditions. Similarly, intelligent endpoint applications for the Smart Grid (e.g., demand response, energy efficiency, renewables, storage, etc.) require an investment by the commercial, industrial, and residential consumer. These too are made more willingly during periods of prosperity.

Security and privacy have the potential to become major pacing items for the Smart Grid, and the current state of these issues in 2015 will be a factor. As Smart Grid deployments progress between 2010 and 2015, electric power providers across the globe will have established some history in the effectiveness of their cybersecurity measures. The key question will center on whether any aspects of the geopolitical climate have affected grid operations, and whether any nation launched a successful cyber attack on another country's electric grid. A close second to this is the hacker issue within the U.S. borders. As with the Internet and the financial services industries, hackers—some looking for financial gains and others seeking fame based on their computer skills—will continue to probe the vulnerabilities of digitally-controlled grid systems. Any headlines citing an interruption of services related to hacker activity will make regulators nervous and send legislators scrambling to the microphones, touting their latest plan to improve security of the grid. Such an event would have a detrimental effect on the rate of deployment.

The characteristics of the concerns over privacy will be somewhat different. There is no argument that the customer's identity must be protected. And, as expressed by the group "Privacy by Design," privacy must be the default—which is to say that if the customer takes no action, their data are protected. The real battle, however, is over the ownership of that data. If it is determined that it is utility company data, there is already talk about ways to "monetize" its value. Possible applications of monetized data mean that a utility company could possibly place targeted advertising inserts in the customer's bill or could permit service providers to send advertisements to the customer's home energy management system, or the utility could

let third-party providers market energy savings or specialized rate plans to those customers. In contrast, customer-owned data means that these kinds of programs would become the exception rather than the rule—their data could not be used for these purposes unless the customer signs up for some kind of marketing service.

Related to the state of the global and U.S. economies, the cost-effectiveness of Smart Grid solutions will continue to have an impact on the rate of adoption. Quite frankly, if consumers do not see the value, either in terms of the solutions available for their home or in terms of the rates they are paying for electricity, they will resist the expansion of Smart Grid services. To date, the state of California has been a case study in terms of the variety and depth of the opposition to the Smart Grid, where accusations of faulty meters, environmental impact of transmission lines, and now health concerns over wireless technologies have all presented obstacles to the progress of Smart Grid deployments.

Adoption rates for electric vehicles, including the accommodations that retailers make for charging them will be an indicator of consumer acceptance, as will the variety of Smart Grid solutions that are available via retail outlets such as Lowes, Home Depot, Wal-Mart, Sears, and Dollar General. Other indicators will include the variety of Smart Grid programs that are available from utility companies such as demand response, dynamic pricing, and energy efficiency, as the willingness of the financial industry to provide capital for Smart Grid projects.

Whereas the progress on the utility side of the meter may be seen as a series of fairly steady gains in operational efficiency, there is bound to be a high level of variability on the customer side of the meter, particularly in the residential market. Homeowners that embrace technology and are comfortable with it will represent an entirely different picture than those of the disadvantaged and elderly, meaning that the continuum of consumer acceptance will be somewhat broad. Just as the VHS versus Beta and HD DVD versus Blu-Ray market forces took two-to-three years to declare a winner, so too will the competing interests for the providers of home energy management systems (HEMS). By the year 2015, it is likely that the consumer technology preferences will finally be sorted out.

As stated earlier in the cybersecurity example, the regulatory environment will continue to have an impact on Smart Grid deployments. Beyond security, feed-in and net-metering tariffs will affect the rates of adoption for consumer-owned renewables and have a major impact on the classification of other distributed energy resources. Issues surrounding transmission corridors—siting, cost allocation, and the notions of federal pre-emption and/or backstop authority—will also be major factors. Questions over the enforcement of cybersecurity requirements between federal and state authorities will be played out in the regulatory arena.

One of the lessons learned about the impact of the cost for a barrel of crude oil that played out between 2006 and 2010 is that the price for a gallon of gasoline has a major impact on the public's appetite for Smart Grid components such as electric vehicles. Similar instability in the cost of doing business for coal, natural gas, and nuclear-generated power will also impact the

desire for other Smart Grid features such as demand response, distributed generation, and renewables.

Also, changes in consumer economics could fuel an appetite for Smart Grid services independent of what the utility companies are doing. Just as the utility companies will pursue the applications that are in their best interests, so too will the consumer. It is very likely that under this scenario, technology vendors will respond by delivering services wherein benefits are not contingent on a corresponding change or deployment by the utility company.

Beyond the regulatory issues associated with the normal channels in the electrical supply chain, new complications brought about by regulations implemented by federal agencies such as the Environmental Protection Agency will have an impact on the popularity of Smart Grid. This not only includes the concerns over carbon emissions and air quality, but also the estimations about the amount of water necessary to sustain the growth in global energy requirements. Actions taken by the 112th, 113th, and 114th Congress in response to federal agency regulations leading into 2015 could either accelerate or decelerate the Smart Grid adoption process.

Appendix C: SGIP-2015

The assumption driving the SGIP vision for 2015 and beyond is based on the implementation of the Smart Grid being a 20-to-30 year effort. As such, there is a need for an industry body under which vendors of all kinds and electric power providers can organize to tackle important issues. Because of its origins, the SGIP is a possible candidate that could evolve into this role. However, because of its current legal standing (the SGIP is not a registered entity), beyond the Smart Grid technology framework and roadmap published by NIST, there needs to be an evolutionary path established for the SGIP. As with the organizational changes recommended for NIST, it is necessary to decompose the expected functionality of the SGIP in 2015 and beyond.

Functions and Activities

As with many technological endeavors in the latter years of the 20th century (e.g., telecommunications, the Internet, etc.), industry will continue to push the performance frontier in terms of Smart Grid for decades to come. As such, it will be as important in 2015 as it is today that there remains a common technology and vendor-neutral forum for industry leaders to discuss their common challenges and potential solutions. Ideally this will also involve the features of the ANSI essential requirements such as Openness, Balance, Lack of Dominance, and Due Process.

If innovation for the grid will continue to be driven in industry, deep pockets of subject matter expertise in each of the functional domains (i.e., generation, transmission, distribution, and consumer) will continue to evolve. Having them organized under a continually functioning SGIP-like body will make this individual subject matter expertise readily accessible by both government and industry implementers of Smart Grid.

Another interesting feature of the government-industry dynamic in the United States is that unlike many countries, we do not have a centralized government effort to write standards. Although we have a "National Institute of Standards and Technology," the process of standards writing in the U.S. rolls up under the American National Standards Institute, or ANSI—an industry body that does not actually write the standards, but accredits the processes for those who do. It should also be noted that the work of ANSI does not stop at the U.S. borders as they also administer the U.S. National Committee for the International Electrotechnical Commission (IEC).

However, while ANSI performs a vital administration function in the standards writing process, they have no responsibility to identify gaps or defects in the content of existing standards, or to suggest possible areas for new standardization, either in the U.S. or abroad. Again, this type of function would be best placed with a neutral, industry-based body such as the SGIP, which could very readily examine any combination of ANSI or non-ANSI standards and specifications within the U.S. as well as international candidates from a variety of sources including the IEC. This would create a global catalog of standards that any industry or government official anywhere in the world could cite.

Combined with the pockets of subject matter expertise as described earlier, the SGIP can remain the coordination point between stakeholders in the standards, manufacturing, and utility industries. It can produce educational materials for federal and state government staffs, regulators, and legislators; provide a common forum for public-private workgroups and committees; and effectively manage the industry semantics so that the concepts behind the conversations are consistent. Further, it would provide input to the Dept. of Energy Clearinghouse and administer industry ballots to achieve consensus on a broad range of industry concerns.

Staffing and Structure

The structure of the SGIP in 2015 is a major question which centers on whether it becomes its own legal entity. Currently, the SGIP is merely a public-private partnership organized under NIST and is not a registered entity in the U.S. However, SGIP does have a logo (See Figure 3) which includes a trademark symbol; this begs the question: Who really "owns" this trademark?

Figure 3. Version of Smart Grid Interoperability Panel (SGIP) Logo

It should also be noted that the application of the trademark "™" symbol is somewhat inconsistent between the various SGIP newsletters, flyers, PowerPoint slides, etc.

The reason this is important is because in 2010, the SGIP was already producing documents with essentially no ownership, if in fact the SGIP has no legal standing as an organization. A select few of the SGIP work products may become government documents, such as the NIST Interagency Report (NISTIR) 7628, *Guidelines for Smart Grid Cyber Security*. However, a vast majority of the documents produced by the membership of the SGIP will not be destined for U.S. Government Printing Office (USGPO) document number and will need to be owned and maintained by some legal U.S. entity. Other concerns would be the fact that you cannot sign a memorandum of understanding or agreement (MOU or MOA) with the SGIP; further, they cannot provide any form of endorsement. For example, in January 2011, the Testing and Certification Committee of the SGIP, the SGTCC, produced an *Interoperability Process Reference Manual (IPRM)* encouraging companies to become testing and certification authorities for various Smart Grid standards. In exchange for their diligence, any company that goes through the process of developing a testing and certification plan will be rewarded by being "listed" as an approved Interoperability Testing and Certification Authority, or ITCA by the SGTCC.

In light of these concerns, it seems obvious that, in order to preserve the value of the work being done today by the SGIP members and to maintain the integrity of the vendor- and

technology- neutral forum for the industry, that the SGIP should become its own legal entity. Possible models for this include the North American Electric Reliability Corporation (NERC), the American National Standards Institute (ANSI), or an “Industry Council” model, such as the Utilities Telecom Council (UTC), or the Sustainable Buildings Industry Council. This would permit the SGIP to charge reasonable dues for its members to enable the federal government to reduce funding the administration of the panel, and thereby allow the SGIP to continue to maintain its own agenda, governing board, charter, and bylaws.

Attachments

Failure to comply with the regulations and terms of an APO is a violation which is subject to sanction.

We are issuing and publishing this administrative review and notice in accordance with sections 751(a)(1) and 777(i) of the Act.

Dated: January 5, 2010.

Ronald K. Lorentzen,

Deputy Assistant Secretary for Import Administration.

Appendix I Decision Memorandum

I. General Issues:

Comment 1: Treatment of VAT and Export Taxes
Comment 2: Selection of Appropriate Surrogate Value for Silica Fume
Comment 3: Selection of Appropriate Surrogate Value for Electricity
Comment 4: Selection of Appropriate Surrogate Value Financial Statements
Comment 5: Treatment of the Silica Fume By–Product Offset
Comment 6: Selection of Appropriate Surrogate Value for Coal
Comment 7: Selection of Appropriate Surrogate Value for Truck Freight
Comment 8: Selection of Appropriate Surrogate Value for Oxygen
Comment 9: Selection of Appropriate Surrogate Value for Polypropylene Bags
Comment 10: Inclusion of Certain U.S. Sales in Margin Calculations
Comment 11: Freight Distances Reported by the Respondents

II. Shanghai Jinneng Issues

Comment 12: Treatment and Valuation of Graphite Powder
Comment 13: Datong Jinneng Reported Electricity Usage

III. Jiangxi Gangyuan Issues

Comment 14: Jiangxi Gangyuan's Production Quantity
Comment 15: Jiangxi Gangyuan's By–Product Offset

[FR Doc. 2010–378 Filed 1–11–10; 8:45 am]

BILLING CODE 3510–DS–S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–AW92

Pacific Halibut Fisheries; Limited Access for Guided Sport Charter Vessels in Alaska

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of application period.

SUMMARY: NMFS will accept applications from persons applying to receive a charter halibut permit under the Limited Access System for Guided Sport Charter Vessels in Alaska. Potential eligible applicants are notified of the one-time opportunity to apply for a charter halibut permit for the 60–day period from February 4, 2010, through April 5, 2010. Any applications received by NMFS after the ending date will be considered untimely and will be denied.

DATES: An application for a charter halibut permit will be accepted by NMFS from 8 a.m. Alaska local time (A.l.t.) on February 4, 2010, through 5 p.m. A.l.t. on April 5, 2010.

ADDRESSES: Application forms are available on the internet through the Alaska Region website at *http://alaskafisheries.noaa.gov/ram/default.htm* or by contacting NMFS at 1–800–304–4846 (option 2). An application form may be submitted by mail to NMFS, Alaska Region, Restricted Access Management, P.O. Box 21668, Juneau, AK 99802, by facsimile (907–586–7354), or by hand delivery to NMFS, 709 West 9th Street, Room 713, Juneau, AK 99081.

FOR FURTHER INFORMATION CONTACT: Rachel Baker, 907-586-7228.

SUPPLEMENTARY INFORMATION: NMFS published a final rule implementing a limited access system for charter vessels in the guided sport fishery for Pacific halibut in waters of International Pacific Halibut Commission Regulatory Areas 2C (Southeast Alaska) and 3A (Central Gulf of Alaska) in the **Federal Register** on January 5, 2010 (75 FR 554). Under this rule, NMFS will issue a charter halibut permit to the owner of a licensed charter fishing business based on the business's past participation in the charter halibut fishery. Section 300.67(h)(1) of the final rule requires NMFS to specify an application period for charter halibut permits of no less than 60 days in the **Federal Register**, and to deny any applications received after the last day of the application period.

This notice specifies a 60–day application period of February 4, 2010, through April 5, 2010. An application period was referenced in the proposed rule published on April 21, 2009 (74 FR 18178) and in the final rule published on January 5, 2010 (75 FR 554). This 60–day application period is consistent with the intent of the final rule to give adequate time for participants in the charter halibut fisheries in Areas 2C and 3A to review the final rule and prepare materials necessary for the application procedure specified at 50 CFR 300.67(h)(3). Beginning on February 1, 2011, all vessels with charter anglers on board that are catching and retaining Pacific halibut in Areas 2C and 3A will be required to have on board the vessel a valid original charter halibut permit with an angler endorsement equal to or greater than the number of charter anglers that are fishing for halibut.

All persons are hereby notified that they must obtain an application on the Internet or request a charter halibut application from NMFS (see ADDRESSES). The application period for charter halibut permits begins at 8 a.m. A.l.t. on February 4, 2010, and ends at 5 p.m. A.l.t. on April 5, 2010. Applicants with incomplete applications will be notified in writing of the specific information necessary to complete the application. Charter halibut permit applications submitted to NMFS (see ADDRESSES) after 5 p.m. A.l.t. on April 5, 2010, will be considered untimely and will be denied.

Authority: 16 U.S.C. 773 *et seq.*

Dated: January 6, 2010.

Emily H. Menashes,

Acting Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. 2010–389 Filed 1–11–10; 8:45 am]

BILLING CODE 3510–22–S

DEPARTMENT OF COMMERCE

National Institute of Standards and Technology

Establishment of NIST Smart Grid Advisory Committee and Solicitation of Nominations for Members

AGENCY: National Institute of Standards and Technology, Commerce.

ACTION: Notice of establishment of the NIST Smart Grid Advisory Committee and solicitation of nominations for members.

SUMMARY: Pursuant to the Federal Advisory Committee Act, the National Institute of Standards and Technology (NIST) announces the establishment of the NIST Smart Grid Advisory Committee (Committee). The Committee will advise the Director of NIST in carrying out duties authorized by the Energy Independence and Security Act of 2007.

DATES: Nominations for members of the initial NIST Smart Grid Advisory Committee must be received on or before February 11, 2010. NIST will continue to accept nominations on an ongoing basis and will consider them as vacancies arise.

ADDRESSES: All nominations should be submitted to George Arnold, National Coordinator for Smart Grid

Interoperability, National Institute of Standards and Technology, 100 Bureau Drive, Mail Stop 2000, Gaithersburg, MD 20899–2000 or via e-mail to *nistsgfac@nist.gov.*

FOR FURTHER INFORMATION CONTACT: George Arnold, National Coordinator for Smart Grid Interoperability, Tel: (301) 975–2232, E-mail: *nistsgfac@nist.gov.*

SUPPLEMENTARY INFORMATION:

I. Background and Authority

The Smart Grid Advisory Committee (Committee), is established to advise the Director of the National Institute of Standards and Technology (NIST) in carrying out duties authorized by section 1305 of the Energy Independence and Security Act of 2007 (Pub. L. 110–140). The Committee is established in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C., App. The Committee will provide input to NIST on the Smart Grid Standards, Priorities and Gaps; and provide input to NIST on the overall direction, status and health of the Smart Grid implementation by the Smart Grid industry including identification of issues and needs. The Committee's input to NIST will be used to help guide Smart Grid Interoperability Panel activities and also assist NIST in directing research and standards activities. Upon request of the Director of NIST, the Committee will prepare reports on issues affecting Smart Grid activities.

II. Structure

The Director of NIST shall appoint the members of the Committee, and they will be selected on a clear, standardized basis, in accordance with applicable Department of Commence guidance. Members shall be selected on the basis of established records of distinguished service in their professional community and their knowledge of issues affecting Smart Grid deployment and operations. Members shall serve as Special Government Employees. Members serve at the discretion of the NIST Director.

Members shall reflect the wide diversity of technical disciplines and competencies involved in the Smart Grid deployment and operations and will come from a cross section of organizations. Members may come from organizations such as electric utilities, consumers, IT developers and integrators, smart grid equipment manufacturers/vendors, RTOs/ITOs, electricity market operators, electric transportation industry stake holders, standards development organizations, professional societies, research and development organizations and academia.

The Committee shall consist of not fewer than 9 nor more than 15 members. The term of office of each member of the Committee shall be 3 years, except that vacancy appointments shall be for the remainder of the unexpired term of the vacancy and that the initial members shall have staggered terms such that the Committee will have approximately ⅓ new or reappointed members each year. Members who are not able to fulfill the duties and responsibilities of the Committee will have their membership terminated. Any person who has completed two consecutive full terms of service on the Committee shall be ineligible for appointment for a third term during the one year period following the expiration of the second term.

The Director of NIST shall appoint the Chairperson and Vice Chairperson from among the members of the Committee. The Chairperson and Vice Chairperson's tenure shall be at the discretion of the Director of NIST. The Vice Chairperson shall perform the duties of the Chairperson in his or her absence. In case a vacancy occurs in the position of the Chairperson or Vice Chairperson, the NIST Director will select a member to fill such vacancy.

III. Compensation

Members of the Committee shall not be compensated for their service, but will, upon request, be allowed travel and per diem expenses in accordance with 5 U.S.C. 5701 *et seq.* while attending meetings of the Committee or subcommittees thereof, or while otherwise performing duties at the request of the Chair, while away from their homes or regular place of business.

IV. Nominations

Nominations are sought from all fields involved in issues affecting the Smart Grid. Nominees should have established records of distinguished service. The field of expertise that the candidate represents he/she is qualified should be specified in the nomination letter. Nominations for a particular field should come from organizations or individuals within that field. A summary of the candidate's qualifications should be included with the nomination, including (where applicable) current or former service on Federal advisory boards and Federal employment. In addition, each nomination letter should state that the person agrees to the nomination, acknowledges the responsibilities of serving on the Committee, and will actively participate in good faith in the tasks of the Committee. The Department of Commerce is committed to equal opportunity in the workplace and seeks a broad-based and diverse Committee membership. Registered lobbyists may not be members.

Date: January 7, 2010.

Marc G. Stanley,

Acting Deputy Director.

[FR Doc. 2010–344 Filed 1–11–10; 8:45 am]

BILLING CODE 3510–13–P

DEPARTMENT OF COMMERCE

Foreign–Trade Zones Board

Order No. 1657

Grant of Authority for Subzone Status, Reynolds Packaging LLC (Aluminum Foil Liner Stock), Louisville, Kentucky

Pursuant to its authority under the Foreign–Trade Zones Act of June 18, 1934, as amended (19 U.S.C. 81a–81u), the Foreign–Trade Zones Board (the Board) adopts the following Order:

Whereas, the Foreign–Trade Zones Act provides for "...the establishment...of foreign–trade zones in ports of entry of the United States, to expedite and encourage foreign commerce, and for other purposes," and authorizes the Foreign–Trade Zones Board to grant to qualified corporations the privilege of establishing foreign–trade zones in or adjacent to U.S. Customs and Border Protection ports of entry;

Whereas, the Board's regulations (15 CFR Part 400) provide for the establishment of special–purpose subzones when existing zone facilities cannot serve the specific use involved, and when the activity results in a significant public benefit and is in the public interest;

Whereas, the Louisville and Jefferson County Riverport Authority, grantee of Foreign–Trade Zone 29, has made application to the Board for authority to establish a special–purpose subzone at the aluminum foil liner stock manufacturing and distribution facilities of Reynolds Packaging LLC, located in Louisville, Kentucky (FTZ Docket 12–2009, filed3–25–2009);

Whereas, notice inviting public comment has been given in the **Federal Register** (74 FR 14956, 4–2–2009) and the application has been processed pursuant to the FTZ Act and the Board's regulations; and,

Whereas, the Board adopts the findings and recommendations of the examiner's report, and finds that the requirements of the FTZ Act and Board's regulations are satisfied, and

U.S. DEPARTMENT OF COMMERCE CHARTER
National Institute of Standards and Technology
Charter of the
NIST Smart Grid Advisory Committee

1. Committee's Official Designation (Title). NIST Smart Grid Advisory Committee.

2. Authority. The NIST Smart Grid Advisory Committee, hereinafter referred to as the committee, was established to advise the Director of the National Institute of Standards and Technology (NIST), hereinafter referred to as NIST, in carrying out duties authorized by section 1305 of the Energy Independence and Security Act of 2007 (Pub. L. 110-140). The committee was established in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C. App., and with the concurrence of the General Services Administration.

3. Objectives and Scope of Activities.

a. Provide input to NIST on the Smart Grid Standards, Priorities and Gaps.

b. Provide input to NIST on the overall direction, status and health of the Smart Grid implementation by the Smart Grid industry including identification of issues and needs.

c. Provide input to NIST on Smart Grid Interoperability Panel activities and on the direction of research and standards activities.

d. Upon request of the Director of NIST, the committee will prepare reports on issues affecting Smart Grid activities.

4. Description of Duties. The duties of the committee are solely advisory in nature in accordance with the provisions of the Federal Advisory Committee Act.

5. Agency or Official to Whom the Committee Reports. The committee shall report to the Director of NIST.

6. Support. NIST will be responsible for all financial and administrative support. Within NIST, this support will be provided by the Engineering Laboratory.

7. Estimated Annual Operating Costs and Staff Years. The annual operating cost of the committee is estimated to be $120,000, which includes .4 work-years FTE of staff support, miscellaneous meeting support costs, other record keeping and copy services, and estimated committee travel and per diem costs.

8. Designated Federal Officer. The Designated Federal Officer (DFO) will be the Director of the Engineering Laboratory. The Director of the Smart Grid Program Office is the alternate DFO. The DFO (or his or her designee) will approve or call all committee meetings, prepare and approve all meeting agendas, attend all committee meetings, adjourn any meeting when the DFO

determines adjournment to be in the public interest, and chair meetings when directed to do so by the Director of NIST.

9. Estimated Number and Frequency of Meetings. The committee shall meet approximately two times per year at the call of the DFO. Additional meetings may be called by the DFO whenever one-third or more of the members so request it in writing or whenever the Director of NIST requests a meeting. The committee shall not act in the absence of a quorum which is two thirds of the total membership.

10. Membership and Designation.

a. The Director of NIST shall appoint the members of the committee, and they will be selected on a clear, standardized basis, in accordance with applicable Department of Commerce guidance. Members shall be selected on the basis of established records of distinguished service in their professional community and their knowledge of issues affecting Smart Grid deployment and operations. Members shall serve as Special Government Employees. Members serve at the discretion of the NIST Director.

b. Members shall reflect the wide diversity of technical disciplines and competencies involved in the Smart Grid deployment and operations and will come from a cross section of organizations. Members may come from organizations such as electric utilities, consumers, IT developers and integrators, smart grid equipment manufacturers/vendors, RTOs/ISOs, electricity market operators, electric transportation industry stake holders, standards development organizations, professional societies, research and development organizations and academia.

c. The committee shall consist of no less than 10 and no more than 15 members. The term of office of each member shall be three years, except that vacancy appointments shall be for the remainder of the unexpired term of the vacancy. Any person who has completed two consecutive full terms of service shall be ineligible for a third term during the one year period following the expiration of the second term.

d. Members of the committee shall not be compensated for their service, but will, upon request, be allowed travel and per diem expenses, in accordance with 5 U.S.C. 5701 et seq., while attending meetings of the committee or subcommittees thereof, or while otherwise performing duties at the request of the Chair, while away from their homes or regular places of business.

e. The Director of NIST shall appoint the Chairperson and Vice Chairperson from among the members of the committee. The Chairperson and Vice Chairperson's tenure shall be at the discretion of the Director of NIST. The Vice Chairperson shall perform the duties of the Chairperson in his or her absence. In case a vacancy occurs in the position of the Chairperson or Vice Chairperson, the NIST Director will select a member to fill such vacancy.

11. Subcommittees. NIST may authorize subcommittees as needed, subject to the provisions of FACA, the FACA implementing regulations, and applicable Department of Commerce guidance. Subcommittees will report only to the committee.

12. Recordkeeping. The records of the committee, formally and informally established subcommittees, or other subgroups of the committee, shall be handled in accordance with General Records Schedule 26, Item 2 or other approved agency records disposition schedule. These records shall be available for public inspection and copying, subject to the Freedom of Information Act, 5 U.S.C. 552. The DFO will oversee recordkeeping and appropriate filings.

13. Duration/Termination. This charter shall terminate two years from its filing with the appropriate U.S. Senate and House of Representatives Oversight Committees unless earlier terminated or renewed by proper authority.

Chief Financial Officer and
Assistant Secretary for Administration

1.26.2012
Filing Date

Dan Sheflin's Bio

Dan Sheflin is currently Vice President and Chief Technology Officer for Honeywell's Automation and Control Solutions (ACS) business. Dan came to Honeywell from General Electric, where he last held the position of General Manager of the Engineering Operations for GE Transportation Systems. He also held Engineering and Technology Leadership positions in GE's Power Generation and Aerospace Businesses. Prior to that, Dan was with Sargent & Lundy. Dan has a Master's degree in Mechanical Engineering from Rensselaer Polytechnic Institute and a Bachelor's degree in Mechanical Engineering from the State University of New York at Buffalo.

ACS is Honeywell's largest business group providing products, solutions, and service offerings for buildings, homes, process industries, power plants, and manufacturing facilities. As CTO of ACS, Dan is responsible for an extensive portfolio of technologies for Honeywell products found in more than 150 million homes, five million buildings, the majority of top refineries and nearly 5,000 industrial sites around the world.

Dan's knowledge of energy management and demand response technologies, deployments and operations is expansive. The Smart Grid offerings he oversees directly address the main uses of energy in homes and buildings – space heating, air conditioning, lighting, and hot water heating. For residences and small buildings, the Honeywell Utility Pro Thermostat with integral In-Home-Display is by far the most widely used demand response thermostat today. Honeywell Utility Solutions, a division of ACS, has expertise with the installation of 11 million meters and has deployed over one million demand response devices (thermostats and switches), which allow load-shedding of over 1 GW at peak times. More importantly, Honeywell has over a century of customer comfort control experience. This knowledge helps utilities shape a wide range of highly flexible cycling, ramping and temperature control strategies that keep their customers comfortable and actively participating in demand response programs.

For larger buildings, Honeywell is a leader in Energy Service Contracting, promoting the installation of energy efficiency measures in commercial buildings and campuses. Upgrades to the building envelope, lighting, HVAC, and appliances all deliver substantial energy savings. In addition, Honeywell has developed enterprise energy management software for a broad spectrum of building services providers and contractors. Honeywell's Energy Manager provides real-time energy monitoring, trending, and analytics for commercial building owners and operators that are serviced directly by Honeywell. By tracking energy usage over time, Honeywell's Continuous Commissioning™ tool uses advanced data mining algorithms to detect and flag short and long term efficiency degradation in equipment and structures.

For centrally managed multi-site retail chains, Honeywell's Novar brand provides 24 hour energy monitoring, trending, alarming, and brokering services. Novar is a pioneer in large-scale Smart Grid deployments, managing centrally over 6 GW of demand in a secure and reliable manner. Some of the early adopters of automated demand response in trials reported in the literature are Novar customers.

Finally, for independent energy service and controls contractors, the Vykon Energy Suite from Tridium (a Honeywell company) provides real time monitoring, trending, analysis and control in a scalable, flexible software package that is compatible with most existing building management systems from any vendor, using any protocol. This the first truly interoperable building automation product and will be used in an automated demand response deployment in Southern California Edison's territory for a Smart Grid Investment Grant award that Honeywell won under Dan's leadership.

In addition to the products mentioned above, Dan also heads Honeywell's research efforts in the Smart Grid area and is well versed in what is needed to enable innovation, create new markets and sustain them. He is responsible not only for identifying technical priorities, gaps, implementation issues and needs but also for assessing the overall direction, status, and health of the Honeywell ACS Smart Grid technologies and solutions portfolio. He can provide the same type of insight for the broader industry and he has a track record of setting industry direction: he was the champion of a very successful industrial wireless project that Honeywell Labs performed for the Department of Energy and the results of which are revolutionizing the process industries through the introduction of novel products. A lot of the knowledge gained from that project has been incorporated into the ISA100.11a wireless standard, which was ratified last year and which is one of the standards under consideration by NIST for the Smart Grid. Under Dan's sponsorship, Honeywell was a major contributor to the ISA100.11a standard. Also, Dan is currently serving as chairman of the Wireless Compliance Institute (WCI), which is the body responsible for conducting compliance and interoperability testing and certification for the ISA100.11a standard. This further attests to Dan's knowledge of and appreciation for standards activities.

Security is one of the major concerns for the Smart Grid. As CTO of ACS, Dan brings the expertise of the Honeywell Security Group, a division of ACS and an industry leader in security and critical infrastructure protection. Dan has also championed projects on cybersecurity of (i) wireless networks for critical infrastructure and (ii) control systems for mission critical applications that Honeywell Labs have performed for the Department of Homeland Security and the Department of Defense, respectively. Since the Smart Grid is a giant control system and employs wireless networks, this experience will be invaluable.

Reliability and safety constitute another major concern for the Smart Grid and Dan has substantial experience in mission critical systems. While at Sargent & Lundy, he designed power plants and participated in NRC's standard setting efforts for the safety of nuclear plants. At GE he was responsible for power systems design, including steam and gas turbines. He has worked with NASA and has led a team that investigated satellite failures. He has also worked with the Federal Railroad Administration on safety aspects for locomotives, on the establishment of safety standards and on numerous safety investigations. In addition, for many years Dan has sponsored the Abnormal Situation Management (ASM) consortium, which started as a NIST ATP program to improve reliability and reduce human errors in the operation of critical infrastructure such as refineries and petrochemical plants. At the end of the NIST program, Dan was instrumental in continuing the consortium of universities, small companies and most major refiners in order to transfer the developed technology into real products that have reduced industrial accidents and saved lives.

DAVID K. OWENS
Executive Vice President, Business Operations
Edison Electric Institute

David K. Owens is Executive Vice President, Business Operations, of the Edison Electric Institute (EEI). In this capacity, he has significant responsibility over a broad range of issues that affect the future structure of the electric industry and new rules in evolving competitive markets. He has responsibility over the strategic areas of energy supply and the environment, energy delivery, energy services and international affairs. He also spearheads efforts to enhance the public policy climate for investments in America's electric infrastructure with emphasis on the role of new technologies to address climate change and enhance energy efficiency through smart buildings, smart appliances, smart meters and smart electric grid.

His responsibilities over the smart electric grid require him to develop and coordinate input from the shareholder-owned electric sector on initiatives from National Institute of Standards and Technology, The Federal Communication Commission, Federal Energy Regulatory Commission (FERC), Department of Energy, state regulatory commissions, consumer organizations, and industry associations including: Institute of Electrical & Electronic Engineers, North American Energy Standards Board, North American Electric Reliability Corporation and others. He has lead responsibility at EEI in representing the industry in forums addressing the smart grid and related matters.

Mr. Owens has frequently appeared before U.S. Congressional Committees, testified in over 50 proceedings on energy issues before state bodies, lectured in universities across the nation, made hundreds of presentations in business forums, and has frequently appeared on TV and radio. He is recognized as one of the foremost authorities on electric utility issues and electric restructuring. Mr. Owens was a key industry spokesperson concerning the Blackout of 2003. He has been at EEI for 29 years, starting his EEI career as Director, Rates and Regulation.

Prior to EEI, Mr. Owens served as Chief Engineer of the Division of Corporate Regulation of the Securities and Exchange Commission. This division was responsible for regulating public utility holding companies. Mr. Owens also was an engineer in the Division of Rates and Corporate Regulation at the former Federal Power Commission, the predecessor to FERC. In that capacity, he frequently appeared in complex regulatory proceedings addressing power supply, transmission and reliability issues. He also worked as a design and test engineer for General Electric and Philadelphia Electric Companies respectively.

He is a graduate of Howard University with a Bachelor and Masters of Engineering degrees. He also has a Masters in Engineering Administration from George Washington University, and has attended executive courses at Howard University, Harvard University, the University of Pennsylvania, and Michigan State University.

Mr. Owens has distinction in Who's Who Among Black Americans, Who's Who In The Government, and has been honored as Outstanding Leader in the Utility Industry. He sits on the Boards of the National Academy of Sciences, the Keystone Center, the American Association of Blacks in Energy, the IDEA Charter School, and is an active member of a number of professional and community-based organizations.

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Jon C. Arnold
Managing Director, Worldwide Power and Utilities
Microsoft Corporation

Jon Arnold is the Managing Director, Worldwide Power and Utilities for Microsoft. As Microsoft's senior executive for Power and Utilities his primary responsibility is to establish and drive Microsoft's industry strategy, which extends his leadership over sales, solutions development, partner activities, marketing, industry standards development, evangelism, industry, government and executive relations, as well as continuing the advancement of Microsoft's worldwide power and utilities team. Most recently, Mr. Arnold was one of the principle founders of Microsoft Hohm, a new online application that brings people together to save money, energy, and preserve the environment. In addition, Microsoft's smart energy reference architecture (SERA) was developed under the direction and leadership of Mr. Arnold.

Prior to joining Microsoft in 2004, Arnold earned more than 30 years of experience in business and technology and more than 18 years of experience in the utilities space, that was characterized by significant involvement in government policy development. Mr. Arnold has developed business, technology and media strategy development for companies such as Capgemini, McGraw- Hill, Edison Electric Institute, American Red Cross, WR Grace & Company, Presearch, Inc, and American Testing & Engineering Corporation. He also worked with public relations and consulting firm GCI Read Poland to develop its energy industry strategy and supporting client communication and product development efforts.

Throughout his career, Arnold has worked with the energy industry on key business and technology issues including: energy efficiency and smart grid; streamlining business practices for retail access; venture capital fund development; emergency and disaster planning and execution; Web development; development of IT human resource and e-business strategies; document management and Federal Energy Regulatory Commission (FERC) filings; defining of computer and network architectures; and, development of information products and conference programs for the power and utilities industry. In policy and standards setting capacities, he has worked on electricity deregulation issues and standards by participating in state working groups and information exchange standards; advised and testified before FERC on energy issues and standards; testified before congress concerning Y2K and industry efforts to minimize risks; participated in the White House and Department of Energy Y2K working groups and readiness evaluation; ran the White House Y2k Power Sector in coordination with DOE and NERC; served as national spokesperson on electric power industry Y2K and information technology issues.

Arnold has been a featured speaker at government hearings and industry conferences. He has testified before Congress, the FERC, and the White House Y2K Power Group on utility technology issues. He has had numerous media interviews with the Wall Street Journal, Time Magazine, MSNBC, FOX, Voice of America and worldwide utility trade and technology magazines. He has made presentations to the National Press Club and appeared on local and national radio as well as national and international television. Recently he was named as one of Greentech Media's top influencers in the Smart Grid market.

Arnold holds a Bachelor of Science degree from the University of Tampa and a Master of Science in Computer Science from The Johns Hopkins University Whiting School of Engineering.

William O. (Billy) Ball
Executive Vice President and Chief Transmission Officer, Southern Company

William O. (Billy) Ball was named Executive Vice President and Chief Transmission Officer, effective April 2010. In this role, Billy is responsible for the planning, design, construction, operation, and maintenance of Southern Company's transmission system.

Prior to his current position, Billy was Senior Vice President, Transmission Design and Construction and had system-wide responsibility for transmission design and construction activities. From 2004 to 2008, he was Senior Vice President, Transmission Planning and Operations, and was responsible for the planning and operations of the Southern Company's network transmission grid, transmission policy and industry interfaces. While in this role, he served as Vice Chairman of the Board of the Southeastern Electric Reliability Council (SERC), and Chairman of the North American Electric Reliability Council (NERC) Members Representative Committee.

Billy's previous experience includes positions at Mirant (formerly Southern Energy) where he was responsible for technical due diligence on business development projects, transmission and O&M support to the various business units, and establishing and implementing safety and health policy at Mirant.

He also held the position of Manager, System Planning, with both generation and transmission planning responsibilities at Mississippi Power, and played a key role in the development and certification of the company's 1,100 MW combined cycle facility at Plant Daniel. He served as Mississippi Power's technical witness in numerous regulatory hearings concerning retail access.

Early in Billy's career with Southern Company, he was responsible for developing transmission pricing methods, the company's first open-access transmission tariffs, and providing transmission policy recommendations and negotiated transmission service contracts with third parties. He also worked on the development of the company's Clean Air Act compliance strategy and has worked in the areas of distribution engineering, system planning, and bulk power contracts. He began his career with Southern Company as a co-op student in Hattiesburg in 1983.

Billy was born and raised in Columbia, Miss. He is a Summa Cum Laude graduate of Mississippi State University with a bachelor degree in Electrical Engineering. He also holds a MBA from the University of Southern Mississippi. Billy is a registered professional engineer in Mississippi and member of the National Society of Engineers.

Billy and his wife, Cindy, have four boys: William, Jordan, Andrew, and Brandon. The family resides in Birmingham.

DTE Energy Company
One Energy Plaza, Detroit, MI 48226-1221

Biography

Lynne Ellyn

Senior Vice President and Chief Information Officer
DTE Energy

Lynne Ellyn is the senior vice president and chief information officer at DTE Energy (NYSE: DTE), a Detroit-based diversified energy company involved in the development and management of energy-related businesses and services nationwide. Ellyn leads an organization of approximately 700 people who provide information technology strategy, development, and computer operations for all of the DTE Energy companies.

Ellyn has an undergraduate degree from Oakland University and an executive M.B.A. from Michigan State University.

Ellyn is a member of IBM's Board of Advisors and Lawrence Technological University's Doctor of Management in Information Technology Advisory Board. She serves on the board of trustees of the Henry Ford Health System Foundation, the Henry Ford Health System Quality Committee, and the DTE Energy Charitable Foundation. Ellyn serves as the 2010 Chair of EEI's TAC (Technical Advisory Committee). She is a fellow of the Cutter Business Technology Council, and writes for the Cutter Business Technology Trends and Impacts Journal.

In the past, Ellyn has served in the following organizations: Trustee, New Detroit Science Center; Co-chair, Women's Initiative-United Way; Dean's Advisory Council, Oakland University Business School; Dean's Advisory Committee, University of Michigan Dearborn Campus Business School; Mentor, Mentium 100; Advisor, Michigan Council of Women in Technology.

In 2002, Crain's Detroit Business named Ellyn as one of the 100 Most Influential Women Business Leaders in the metropolitan Detroit area. In 2003, the Association for Women in Computing named Ellyn as one of the Top Michigan Women in Computing. In August 2004, CORP! Magazine named Ellyn as one of Michigan's Top Business Women.

Evan R. Gaddis

PRESIDENT AND CHIEF EXECUTIVE OFFICER

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

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Evan R. Gaddis is president and CEO of the National Electrical Manufacturers Association (NEMA), the leading trade association in the United States representing the interests of electrical and medical imaging manufacturers. Founded in 1926, its approximately 430 member companies manufacture products used in the generation, transmission and distribution, control, and end-use of electricity and medical imaging. Domestic shipments of electrical products produced by NEMA members exceed $100 billion.

Before joining NEMA, Mr. Gaddis served as president of the Gas Appliance Manufacturers Association. Previously, General Gaddis built a successful career in the United States Army. He served in many domestic and international assignments. He retired from the United States Army as a Major General.

Mr. Gaddis holds a B.S. from Cameron University in Lawton, Oklahoma, and an M.B.A. from the National University in San Diego, California. Current professional affiliates include Board of Director, Electrical Safety Foundation International; Industry Data Exchange Association; U.S. Chamber Institute for 21st Century Energy, and Advisory Board, U.S. Army Recruiting. Evan and his wife, Bonnita, have two children, Brent and Renee.

ALSTOM

CAREER PROFILE

Lawrence E. Jones, Ph.D.
Vice President, Regulatory Affairs, Policy & Industry Relations, North America

Dr. Lawrence E. Jones has over 20 years of experience in the energy industry with expertise in, power systems engineering, applications of information, communications and control technologies in power grid and electricity market operations, smart grid solutions and technologies including HVDC and FACTS, and renewable energy integration.

He joined Alstom Grid Inc. in 2000 and is currently Vice President, Regulatory Affairs, Policy and Industry Relations, North America. He also serves on the company's global smart grid business development team.

Prior to his current position, he was Director of Strategy and Special Projects, worldwide, with the Network Management Systems (NMS) product line of the automation business unit, and led its renewable energy integration activities globally. He also served as Director of Business Development for the Americas and Director of the Transmission Optimization and Partnering (TOP) which was formed after a series of blackouts in the U.S. and other parts of the world in 2003.

Dr. Jones is affiliated with several professional societies and academic institutions. He is Senior Member of the Institute of Electrical and Electronics Engineers (IEEE). He has been at the forefront of the Smart Grid industry in the US. He represented Alstom Grid Inc. at, and actively participated in, several of the foundational meetings and activities of the GridWise Alliance from 2003 – 2005. Dr. Jones co-founded the International Workshop on *Large-Scale Integration of Wind Power and Transmission Networks for Off Shore Wind Farms* in Stockholm, Sweden in 2000.

He is a contributor to and reviewer of industry periodicals and has published numerous articles in technical journals, industry magazines and conference proceedings. His recent articles include: "Smart Sustainability – Beware of Black Swans" published in *Platts Insight – Road to Sustainable*, June 2010; "How Smart Grid Applications will Aid Wind Integration" published in *North American Wind Power* Vol. 7, No. 5, May 2010; "Bulk Renewable + Bulk Transmission: Recipe to Feed 10 Billion Enervores and Save the Planet" in *ElectroIndustry*, January 2010; and "Integrating Variable Renewable Generation in Utility Operations" published in *Utility Automation*, April 2009.

Dr. Jones received his MSc, Licentiate and PhD degrees in Electrical Engineering from the Royal Institute of Technology in Stockholm, Sweden.

SUEDEEN G. KELLY

Partner

Energy and Natural Resources
Electricity
Energy-Related Public Policy
Natural Resources
Nuclear
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Smart Grid

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Education

- Cornell Law School, J.D., *cum laude*, 1976
- University of Rochester, B.A., *with distinction*, 1973

Bar Admissions

- District of Columbia
- New Mexico

Court Admissions

- U.S. Court of Appeals for the District of Columbia
- U.S. Court of Appeals for the 10th Circuit
- U.S. Court of Appeals for the 9th Circuit
- U.S. District Court for the District of Columbia
- U.S. District Court for the District of New Mexico

Awards and Honors

- Commissioner, Federal Energy Regulatory Commission (2003-2009)
- Top U.S. Energy Leader, CNBC Executive Vision 2009
- Champion 2010, Women's Council on Environment and Energy

Suedeen Kelly is an internationally-recognized energy industry veteran and former Commissioner with the Federal Energy Regulatory Commission (FERC). She represents a variety of clients in the electric and natural gas industries on business, regulatory, litigation and policy matters such as smart grid, renewable energy, electricity transmission, electricity and gas markets, natural gas infrastructure, natural gas quality standards, carbon emissions, clean energy technologies, energy efficiency and many others. Ms. Kelly's knowledge of the national electricity and natural gas industries includes significant experience in infrastructure development and operation, market structures and financial products, emerging technologies, federal and state laws and regulations, impending policy changes and domestic/international market interrelations.

Nominated by Presidents Bush and Obama to three terms as FERC Commissioner, Ms. Kelly resolved 7,000 disputes with published Commission decisions and personally authored 100 separate statements during her tenure. She is credited with spearheading change in numerous regulatory policies, including integration of renewables into the grid, transmission interconnection and planning reform, deployment of smart grid technology to the transmission grid, the inclusion of smart grid demonstration grants in the stimulus effort, and natural gas quality standards to facilitate U.S. entry of liquefied natural gas. Ms. Kelly created a Smart Grid Collaborative between FERC and the association of state regulators to promote technology deployment and helped to grow membership to 30 states. She also pioneered internal strategic planning efforts to enable market reforms to adapt to new Congressional proposals regarding carbon emissions, demand response and efficiency, smart grid and hydrokinetic, offshore wind turbine and photovoltaic technologies.

In addition to her time at FERC, Ms. Kelly served as regulatory counsel for the California Independent System Operator and was a law professor at the University of New Mexico School of Law where she taught energy law, utility regulation, administrative law and legislative process. In 1999, Ms. Kelly worked as a legislative aide to Sen. Jeff Bingaman, then the ranking member of the Senate Energy & Natural Resources Committee. She also served as Chairwoman and Commissioner for the Public Service Commission of New Mexico, in the private practice of law in New Mexico and Washington, DC, and as an attorney for the Natural Resources Defense Council.

- Gilbert and Sarah Kerlin Lecturer on Energy Law, Pace Law School (2009)
- Gridwise Alliance Award for Leadership (2008)
- Chair and Commissioner, New Mexico Public Service Commission (1983-1986)
- Lewis & Clark Law School Distinguished Visitor (1998)
- Keleher & McLeod Professor of Law (1997-1999)
- Susan and Ronald Friedman Excellence in Teaching Award (1995-1996)

Professional Affiliations:

- Advisory Council, Women's Council on Energy and Environment (2008 – present)
- Council Member, American Bar Association Section of Administrative Law and Regulatory Practice (nominated 2010)
- Council Member, American Bar Association Section on Environment, Energy and Resources (2000-2003)
- Board Member, Santa Fe Diocese Foundation (1999-2003)
- Founding Board, Albuquerque Open Space Alliance (1996-1999)
- Trustee, Rocky Mountain Mineral Law Foundation (1988-1993)
- Research Advisory Board, National Regulatory Research Institute, Ohio State University (1988-1992)
- Chair of Advisory Council, U.S. Consumer Product Safety Commission (1979-1981)

SUSAN M. MILLER
PRESIDENT AND CEO
ALLIANCE FOR TELECOMMUNICATIONS INDUSTRY SOLUTIONS
Washington, D.C.

Susan M. Miller is President and Chief Executive Officer of the Alliance for Telecommunications Industry Solutions ("ATIS") and has served in this role since 1999.

Miller is credited with bringing an innovative, market-driven approach to the development of standards and as a result, expanding ATIS' reach and activities. Under her leadership, ATIS redefined the manner in which the information, communications technologies' industry's standardization needs are met. The approach identifies and engages the industry's business driven needs and priorities to define and drive critical standards development in support of these priorities. Chief technology officers and senior industry executives from the leading service provider, manufacturing, network testing, IT, software, and consulting companies serve on the ATIS Board of Directors and define the priorities to drive this effort. Her approach and the dialogue created as a result, has attracted a blue-ribbon Board. The approach also includes a Chief Information Officers' Council in recognition of network/IT integration in the marketplace, giving ATIS the distinction of an integrated approach to its work and its solutions.

Miller has also created and fostered global collaborative relationships with numerous industry and standards organizations, to include ATIS' role as a partner in organizing the Third Generation Partnership Project for wireless technologies and services, and the founding of the Global Standards Collaboration – an annual meeting of the regional standards organizations from around the globe which hold strategic discussions on global high interest subjects. Other significant relationships include collaborative programs with the United States Telecom Association, the European Telecommunications Standards Institute, the Broadband Forum, and the Internet Engineering Task Force, to name a few. Miller has spoken extensively on a number of initiatives, including changing the fundamental processes and paradigm for standards development and the role of standards in the evolution of Next Generation Networks and technologies.

ATIS is the leading developer of standards for the information and communications technologies industry. A non-profit, member company organization based in Washington, D.C., ATIS' twenty industry committees, forums, and Incubator Solutions Program address technical and operational issues and develop standards for the implementation of new technologies into the communications network. Priorities addressed by ATIS committees include IPTV, home networking, cloud computing, convergence , network interoperability and optimization, environmental sustainability, service-oriented networks, cyber security, voice over the Internet Protocol, E 9-1-1, and telecom fraud, among others. ATIS is unique among standards organizations in that it addresses not only technical, but operational, business process, and application issues, when identifying solutions to industry-wide challenges. Over 600 professionals from more than 250 communications companies work collaboratively within ATIS committees and Incubators to produce industry solutions in a timely, market-driven manner.

Miller represents ATIS before the Federal Communications Commission ("FCC"), the U.S. Department of State, the Department of Commerce, as well as other federal agencies. She serves on two federal advisory committees – the FCC's Communications Security, Reliability, and Interoperability Council, and the State Department's Advisory Committee on International Communications and Information Policy Committee. She served on the American National Standards Institute Board of Directors, the University of Oklahoma Institute of Telecommunications Board of Directors, the International Engineering Consortium Advisory Council, and the North American delegation to the Third Generation Partnership Project. She is a member of the American Society of Association Executives, the National Association of Female Executives, and the Society for Women in Cable and Telecommunications. Miller was recognized by the University of Pennsylvania, Annenberg Public Policy Center's report, *The Glass Ceiling in the Executive Suite: The 2nd Annual Analysis of Women Leaders in Communications Companies* as well as *the National Journal*, as the only woman president and CEO among the thirteen most influential U.S. telecommunications associations. In 2005, she was further recognized by *Technology Daily* as the only woman president and CEO within the ranks of the top 25 technology associations.

Prior to her appointment as President and CEO in 1999, Miller was ATIS' Vice President and General Counsel. She has served with the organization since 1988. Prior to 1988, Miller practiced communications law for the Wall street firm of Weil, Gotshal & Manges, and she worked for GTE. She received her Juris Doctorate from Catholic University's Columbus School of Law in 1984, and in 1981, her Bachelor of Arts in English Literature and Art History, with a minor in Economics from Dickinson College in Pennsylvania.

Overview

Name: Terry Mohn
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Website: www.balanceenergysolutions.com
Affiliation: Vice Chairman
Company: GridWise Alliance
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Website: www.gridwise.org

Biographical Information

Terry Mohn is a founder and Chief Innovation Officer of Balance Energy located in San Diego California. Balance Energy engineers and builds clean and renewable electric generation that reliably meet the demands of utilities, municipalities and communities. This includes executive responsibility for company's technology portfolio and capabilities towards emerging integrated microgrids and sustainable community solutions. Terry was previously chief technology strategist for the Sempra Energy utilities, with emphasis on smart grid. He specializes in the clean energy and the improvement of the electric grid by using modern technology.

He has 30 years' experience in large-scale system architecture, business strategy, and technology investment strategy. Terry specializes in the business integration of technologies, primarily supporting smart grid, home automation systems, communication systems, distribution automation, smart metering, demand response, and sense and control. He also is very involved in technology research, funding and commercialization and works closely with major California universities. Terry presently serves as Vice Chairman of the GridWise Alliance, a consortium of public and private stakeholders who share a vision and stewardship that the nation's electric system must modernize for the country to remain competitive on the world market. Prior to his energy roles, Terry was chief technology officer for an international broadband media company and founder of two Internet companies.

GE Appliances
Appliance Park
Louisville, KY 40225

Kevin Nolan
Vice President-Technology
GE Appliances

Kevin Nolan, Vice President, Technology, for GE Appliances. Kevin is responsible for helping drive the Appliance business' growth strategy by integrating technology innovation into product design. His success in building strong teams and robust processes has played a significant role in the business' decisions to increase R&D investment, create new lines of business and launch new products. As a member of the senior leadership team he also plays a key role in commercializing new technologies through new business models and partnerships.

Kevin assumed the Technology VP position in November of 2006. In his 21-year GE career, he progressed through various cross-functional operating roles in GE's Home and Business Solutions and Industrial businesses.

Kevin is a member of the Emerging Technologies Panel of the National Electrical Manufacturers Association (NEMA) that focuses on providing timely information and analysis of new and emerging technologies. Kevin is a member for National Institute of Standards and Technology (NIST) Smart Grid Federal Advisory Committee (SGFAC). The SGFAC is established to provide input to NIST on the Smart Grid Standards, Priorities and Gaps; and to provide input to NIST on the overall direction, status and health of the Smart Grid. Kevin serves on the Board of Advisors for the Speed School of Engineering of the University of Louisville, where the focus is on providing an advocacy group for the school and the engineering profession in general. He is also a committed community leader and is an Executive Board member of The Louisville Science Center, where he helps the Center execute its mission to advance science literacy by encouraging people to explore science in everyday life.

Throughout his career he has continued to develop new technology with 15 patent awards and has been involved in the design and launch of numerous innovative appliance products.

Kevin grew up in Connecticut and graduated from the University of Connecticut as an Honors Scholar with a degree in Mechanical Engineering. After university graduation, he entered the prestigious GE Edison Engineering program. Kevin and his wife Emily reside in Louisville and have two children – Kate and John.

Simon Pontin
Chief Technology Officer
Itron, Inc.

Simon Pontin has over 20 years of experience in the electricity utility business where he has held various positions related to product and system developments. Pontin was named Chief Technology Officer (CTO) at Itron in January 2011. As CTO, Pontin is uniquely equipped to ensure that Itron's technology helps utilities solve some of their most pressing challenges.

Pontin joined Itron (then Schlumberger Electricity) in 1989 and spent the first half of his career in Felixstowe, England participating in the design of various solid-state metering developments. In 1995, he moved to the United States where he was responsible for the development and introduction of the CENTRON® solid state meter. In 2006, he took the helm in developing Itron's smart grid solution, OpenWay®.

Pontin has a Bachelor of Engineering from Aston University in England.

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William H. Sanders is a Donald Biggar Willett Professor of Engineering, the Director of the Information Trust Institute, and the Acting Director of the Coordinated Science Laboratory at the University of Illinois at Urbana-Champaign. He is a professor in the Department of Electrical and Computer Engineering and Affiliate Professor in the Department of Computer Science. He is a Fellow of the IEEE and the ACM, a past Chair of the IEEE Technical Committee on Fault-Tolerant Computing, and past Vice-Chair of the IFIP Working Group 10.4 on Dependable Computing.

Dr. Sanders's research interests include secure and dependable computing and security and dependability metrics and evaluation, with a focus on critical infrastructures. He has published more than 200 technical papers in those areas. He is currently the Director and PI of the DOE/NSF/DHS Trustworthy Cyber Infrastructure for the Power Grid (TCIP) Center and the new DOE/DHS TCIPG Center, which are at the forefront of national efforts to make the U.S. power grid smart and resilient.

He is also co-developer of three tools for assessing computer-based systems: METASAN, *UltraSAN*, and Möbius. Möbius and *UltraSAN* have been distributed widely to industry and academia; more than 500 licenses for the tools have been issued to universities, companies, and NASA for evaluating the performance, dependability, and security of a variety of systems. He is also a co-developer of the Loki distributed system fault injector, the AQuA/ITUA middlewares for providing dependability/security to distributed and networked applications, and the NetAPT (Network Access Policy Tool) for assessing the security of networked systems.

S&C ELECTRIC COMPANY

Thomas J. Tobin
Chief Technology Officer
S&C Electric Company

Tom Tobin is the Chief Technology Officer, for S&C Electric Company, a major manufacturer of high-power and high-voltage switching, protection and control systems for utilities and large power users. Tom oversees S&C's development program ensuring the flow of innovative new products and services, the identification and adoption of new technologies, and the creation of efficient and effective product development practices and processes. In addition, he oversees the Advanced Technology Center, a world-class testing laboratory that includes two 850-megawatt electrical short-circuit test generators that can test up to 100 kA and up to 230,000 volts. Prior to his present role, Tom was Vice President of R&D, responsible for major new product development projects, supporting five operating divisions. These products span the range of circuit switchers rated up to 230 kV and 25 kA interrupting rating to whole-facility uninterruptible power supplies (UPS) rated up to 20 MVA. Included among the breakthrough developments Tom led are the R&D 100 Award winning IntelliRupter PulseCloser.

Tom graduated from Rensselaer Polytechnic Institute with Bachelors and Masters Degrees in Electric Power Engineering. His career has spanned 42 years with S&C Electric Company in various roles including product development engineer, Director of engineering for all of S&C products, Vice President – R&D, and Chief Technology Officer. Tom's expertise lies in the design, testing, and application of switching devices and controls for large electric power systems.

Tom is a Fellow of the IEEE and a member of various IEEE standards development committees in the area of switchgear, and is active in international standards development through the IEC where he is the U.S. Technical Advisor to Technical Committee 17—Switchgear and Controlgear. Tom has also participated in several CIGRE Committees (International Council on Large Electric Systems), providing analysis and guidance for future standards writing. Tom serves on the Management Board of NEETRAC and is a committee member of The National Institute of Standards and Technology (NIST) Smart Grid Federal Advisory Committee. He holds 28 US patents and several international patents related to high voltage switches, fuses, or circuit interrupters, and is a Registered Professional Engineer in Illinois.

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David Vieau, President and CEO, A123 Systems

David Vieau is the President and Chief Executive Officer of A123 Systems [NASDAQ: AONE], which is one of the world's leading suppliers of high-power lithium ion batteries, designed to deliver a new combination of battery power, safety and life. The company's breakthrough technology, innovative multinational manufacturing model, and experienced executives are providing the power to change the game for today's Transportation, Electrical Grid Services and Portable Power manufacturers.

Mr. Vieau brings more than thirty years of experience and leadership in developing rapid-growth technology and component businesses. Applying his expertise to A123 Systems, Mr. Vieau has led the expansion of A123 from its initial creation to more than 1,600 employees. Under his leadership, the company has received nearly $350 million in private financing and $349 million in government grants and loans. Most recently, he led the company through its initial public offering in September of 2009.

Prior to A123 Systems, Mr. Vieau held corporate officer positions at American Power Conversion [NASDAQ: APCC], serving as VP of Marketing and VP of Worldwide Business Development. During his nine years at APC, Mr. Vieau helped grow the company from $50MM to $1.5B, becoming the world leader in power protection for IT markets and employing 6,000 globally.

Mr. Vieau earned a Bachelor of Science Degree in Mechanical Engineering from Syracuse University in 1972.