Overview of NIST Smart Grid Federal Advisory Committee

Under the Energy Independence and Security Act of 2007 (EISA 2007), the National Institute of Standards and Technology (NIST) has "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 September 2010, NIST named 15 individuals from U.S. industry, academia, and trade and professional organizations to serve on its Smart Grid Federal Advisory Committee (SGFAC). (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 SGFAC 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 National Electrical and Medical Imaging Equipment Manufacturers (NEMA)

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Lawrence E. Jones
Director, Strategy and Special Projects Worldwide
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
Vice President for Development
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
Vice President, R&D
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

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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 SGFAC 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.

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 were conducted by the four subcommittees to further inform the development of the report throughout Fall 2011. At the time of the writing of this report, a final SGFAC face-to-face meeting was scheduled to be held at NIST to conduct a final review and adoption of this report.

Executive Summary

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 commitment and support of this plan and process from nearly 70 top executives from the power, information technology, and other 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 the EISA. The SGFAC agrees with the Federal Energy Regulatory Commission (FERC) decision in July 2011 (RM11-2) 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

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At the time of the writing of this report, membership in the SGIP has grown to over 680 organizations; approximately 1,800 individuals currently participate in the various committees, working groups, and working teams within the SGIP structure.

In January 2010, the SGIP 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, Release 2.0 was made available and NIST is seeking 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 has 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 a "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.

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The Smart Grid Federal Advisory Committee (SGFAC) 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 which 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 its many accomplishments over the last two and a half years, as outlined above.

In September 2010, Dr. Patrick Gallagher, Director of the National Institute of Standards and Technology (NIST), charged the Smart Grid Federal Advisory Committee (SGFAC) 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 SGFAC formed four subcommittees to address this challenge. Over the ensuing 14 months, the subcommittee members have worked with smart grid industry stakeholders, including industry associations, companies and state and federal regulators, to gather, consider and analyze information and produce this status report. Through its efforts, the SGFAC has identified several common emerging themes across the diverse smart grid stakeholder landscape.

Emerging Themes from the NIST SGFAC Report

- **Prioritize, streamline and leverage NIST Smart Grid Activities**
    - With multiple organizations vying for the input of Smart Grid stakeholders, the stakeholders' already scarce resources are worn too thin to be effective. For this reason, NIST, SGIP and other organizations working to advance the Smart Grid need to prioritize and consolidate their efforts. This will allow them to focus the stakeholders on the most urgent issues and use their resources in the most efficient way possible to reach meaningful conclusions.

- **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 solid 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.

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- **Need to continue the focus on transparency, roles and responsibilities**
    - Much of the hesitation or lack of participation by stakeholders in the Smart Grid is 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. Greater transparency, combined with heightened educational efforts, will allow stakeholders at all levels to work together.

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

- **Urgent need for a communication plan, education and outreach effort regarding importance of interoperability standards and research activities**
    - It is important that stakeholders understand the value of the new business models enabled by the SGIP and resulting standards. 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 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 SGFAC Subcommittees One and Two interviewed 21 Smart Grid stakeholders. 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.

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- 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 stakeholder community. However, the major roadblock to stakeholder participation is their lack of resources in comparison to the multitude of Smart Grid activities demanding their time and expertise. As discussed above, 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, education and outreach for greater utility and state participation**
  - 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 stakeholders and encourage their involvement in the SGIP process.

- **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 16.

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

The SGFAC Subcommittee Three focused on defining the structures, roles, and relationships of the U.S. Department of Energy, NIST, and the Smart Grid Interoperability Panel (SGIP) as they are now and as they will need to be to advance the goals of the Smart Grid five years in the future. The following three themes emerged from their 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 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 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 collaborate to define the Federal response to national cyber emergencies.

- **NIST will need to reach down into 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 the industry in order to develop standards that will both meet the needs of the Smart Grid and practically apply 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 25.

Recommendations on NIST Smart Grid Research Activities

In Section Three, the SGFAC 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:

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[Subcommittee Four to supply themes.]

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

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