



National Electrical Manufacturers Association

Representing Electrical and Medical
Imaging Equipment Manufacturers
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**Testimony of John Caskey, Assistant Vice President for Operations
National Electrical Manufacturers Association (NEMA)**

**HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON TECHNOLOGY & INNOVATION**

“Empowering Consumers and Promoting Innovation through the Smart Grid”

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Good morning, Chairman Quayle and Members of the Subcommittee. My name is John Caskey and I am Assistant Vice President of Operations and Director of the Power Equipment Division at the National Electrical Manufacturers Association (NEMA). I want to thank you for providing me the opportunity to testify today.

My testimony today is informed by over 30 years of experience in the energy field. As the Director of the Power Equipment Division at NEMA, I work directly with the manufacturers that make products that comprise the electric grid and the evolving smart grid. I have had the opportunity to work with National Institute of Standards and Technology (NIST) and most of the other stakeholders in the Smart Grid community since the signing of the Energy Independence and Security Act of 2007 (EISA).

I serve as the Vice-Chair of the Governing Board of the Smart Grid Interoperability Panel (SGIP), Chair of the SGIP Vision/Mission/Roadmap Task Team, and a member of the SGIP Business and Operating Procedure Working Group.

NEMA is the trade association of choice for the electrical and medical imaging manufacturing industry. Founded in 1926 and headquartered in Rosslyn, Virginia, our member companies manufacture products used in the generation, transmission and distribution, control, and end use of electricity that exceed \$120 billion in worldwide sales. These products are used in utility, medical imaging, industrial, commercial, institutional, and residential applications. In addition to our headquarters in Rosslyn, Virginia, NEMA also has offices in Beijing and Mexico City.

One of NEMA's primary missions—of particular relevance to today's hearing—is that we are a Standards Development Organization, or SDO, accredited by the American National Standards Institute (ANSI). A NEMA standard defines a product, process, or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which the products are designed.

NEMA believes that standards play a vital part in the design, production, and distribution of products and systems destined for both national and international commerce. Sound technical standards benefit the user, as well as the manufacturer, by improving safety, bringing about economies in manufacturing processes, eliminating misunderstandings between manufacturer and purchaser, and assisting the purchaser in selecting and obtaining the proper product for his particular need.

NEMA member companies are technology leaders and had been researching, developing, and deploying Smart Grid technologies for many years, well before the term Smart Grid was even coined. However, as technological advances accelerated across the power equipment and telecommunications industries, the need to establish a set of interoperability standards for the Smart Grid became increasingly important.

The Energy Independence and Security Act of 2007 (EISA), in which this committee played a critical role, has blazed new trails in the development of the Smart Grid. Title XIII of EISA

charged the National Institute of Standards and Technology (NIST) with the lead role in with coordinating the development of a framework and model standards to ensure interoperability in the Smart Grid. NEMA is one of the non-government organizations named in EISA to work with NIST on the implementation of the “Interoperability Framework” of standards for Smart Grid.

From the perspective of an organization with more than 85 years of experience with standards development, NEMA applauds the work done thus far by the National Institute of Standards and Technology, the Smart Grid Interoperability Panel (SGIP), and the National Coordinator for Smart Grid Interoperability.

The benefits we will see as a result of the development of a Smart Grid are extraordinary. Layering on communications and other technologies to improve the intelligence of the electrical delivery system will increase grid reliability, improve power quality, reduce the frequency and duration of outages, promote economic growth through development of new technologies and an improved electric infrastructure, bolster efficiency by giving grid operators and utilities greater situational awareness, and--as the name of today’s hearing indicates--empower the ratepayer to become an active participant in the electricity delivery system.

Legal Authority

As you know, the House Science, Space, and Technology Committee was instrumental in creating the foundational legislation that has put our nation on a course to develop a Smart Grid.

EISA Section 1305 states:

“The Director of the National Institute of Standards and Technology shall have primary responsibility to coordinate the development of a framework that includes

protocols and model standards for information management to achieve interoperability of smart grid devices and systems. Such protocols and standards shall further align policy, business, and technology approaches in a manner that would enable all electric resources, including demand-side resources, to contribute to an efficient, reliable electricity network. In developing such protocols and standards--

(1) the Director shall seek input and cooperation from the Commission, the Office of Electricity Delivery and Energy Reliability and its Smart Grid Task Force, the Smart Grid Advisory Committee, other relevant Federal and State agencies; and

(2) the Director shall also solicit input and cooperation from private entities interested in such protocols and standards, including but not limited to the Gridwise Architecture Council, the International Electrical and Electronics Engineers, the National Electric Reliability Organization recognized by the Federal Energy Regulatory Commission, and National Electrical Manufacturers Association.

Standards and the Role of the Federal Government

Before I go on to describe the work that has been done as a result of EISA, I would like to address a few more basic questions. What are standards, why do we need them, and why is it important that the federal government be involved?

The interoperable, or smart, electrical grid consists of many different products, woven into a complex “system of systems” that must seamlessly provide sufficient and cost-effective electrical energy to power our homes, offices, schools, and businesses.

The scale, complexity, and interconnectedness of the electrical grid require that everyone and everything involved in developing and managing it are “playing from the same sheet of music.” The Smart Grid is managed and coordinated by modern communications and control software which, in order to work optimally together, must share a common language and common understanding of the operational details of the many interconnected elements of the power grid. Reliable and effective interoperability requires a foundation of standards.

Now, why is it beneficial to have the federal government involved? While only a handful of areas in the U.S. were electrified in 1900, by the time we reached the 21st Century, electricity had become the cornerstone of the American way of life. Without electricity today, we could not pump our water, feed our citizens, charge our electronic devices, operate our military, or provide almost any of the vast variety of vital government services. The electric grid is clearly the most critical piece of our national infrastructure.

In the U.S., standards are typically developed by the private sector with varying degrees of participation by the government. EISA has opened the door to a more active government role providing an “umbrella” under which the private sector defines standards for Smart Grid products and systems.

A successful Smart Grid implementation mandates interoperability between utility operators which will transcend current jurisdictional boundaries. For as long as utility companies have been regulated entities, tensions have existed between state and federal regulators. Now, as Smart Grid applications like demand response can reach from the meter of a homeowner in one state to the hydroelectric dam operator in another, there are a number of new challenges which will rise to the federal level. One issue that is already gaining attention at the federal level is cyber security of the Smart Grid as utilities wrestle with the prospect of securing their operations across state boundaries and varied utility commission service areas.

Implementation of the Energy Independence and Security Act of 2007 (EISA)

NIST's leadership in the development of a Smart Grid has been exemplary and NEMA has been extremely pleased with the way in which the provisions in EISA have been carried out.

Once NIST received its initial funding, the agency spent time evaluating the Smart Grid environment and inventorying available Smart Grid-related standards as directed by EISA. NIST then established the Smart Grid Interoperability Panel (SGIP) in November 2009. According to its charter, the mission of the SGIP is to "provide an open process for stakeholders to participate in providing input and cooperating with NIST in the ongoing coordination, acceleration and harmonization of standards development for the Smart Grid."

The SGIP serves as an unparalleled forum where private industry can gather to discuss the future of the Smart Grid.

Participation of so many stakeholders across the Smart Grid spectrum in the SGIP is a testament to its importance. The SGIP comprises 22 stakeholder categories representing the breadth of the electrical industry and includes over 600 organizations and more than 1,800 individual participants. Current membership in the SGIP includes a variety of international interests from several countries across the globe, but most importantly from our trading partners in Canada and Mexico, both of whom sell electricity to U.S. utilities. In addition, the SGIP has a governing board structure elected from the stakeholders plus three at-large members. The SGIP is organized through a charter and bylaws to cover operating policy and provides membership opportunities for domestic and international interests. Indeed, the SGIP has also functioned as a conduit to its international peers for Smart Grid activity across the globe.

NEMA has been fully engaged in the progression of the SGIP. Representatives from NEMA-member companies as well as NEMA staff have served in numerous elected positions of the SGIP. NEMA's objective for the future of Smart Grid is to continue to provide quality leadership and make sure that the human capital required to run the SGIP is well supported by both NEMA staff and member companies.

While the first few months of the SGIP were devoted to getting the organization up and running, its members are now addressing critical issues around cyber security, smart metering, home area networks, in-home communication standards, etc. By identifying a consolidated list of technology gaps, referred to as "Priority Actions Plans" or PAPs, some of the most pressing needs have already been address through new standards developed by the SDOs participating in the SGIP. This will continue to be an ongoing process with a lot of this work completed in the remaining months of 2011 and into 2012.

It was, and continues to be, NEMA's belief that the federal government can serve as a partner with industry in the effort to establish Smart Grid standards. As the convener of the SGIP, NIST-funded resources have provided a valuable administrative role, allowing free public access to the proceedings and enabling the industry to focus their resources on the work of identifying and developing standards. Relative to the subtleties of the NIST-SGIP relationship, it is important to note that these are NOT government contractors simply executing NIST's vision for the Smart Grid. Instead, NIST's funding provides a democratic forum in which the industry's vision for the grid can be developed and mature on its own with the NIST staff getting a front-row seat to the process and immediate access to the results.

At the same time, the NIST Framework and Roadmap for the Development of Smart Grid Interoperability Standards (NIST Special Publication 1108, dated January 2010) provides a playbook that any interested party can use to get involved with Smart Grid. Over the last two years, as part of a program with the U.S. Department of Commerce the NEMA staff has

had an opportunity to meet with several trade delegations from other countries about their Smart Grid efforts.

NEMA encouraged the formation of the International Electrotechnical Commission (IEC) Strategy Group on Smart Grid in 2008, which brought Smart Grid experts together from 14 different nations to develop a framework for international smart grid protocols and model standards to achieve interoperability of Smart Grid devices and systems. A roadmap has now been released based on existing international standards that can be used consistently for today's utility projects in many parts of the world. The NIST effort is coordinating with IEC to encourage adoption of global standards that reflect U.S. practices wherever it makes sense.

Smart Grid standards are a particular challenge. They will require an evolution from simple physical standards, such as defining the key features of an everyday 120-volt plug, to very complicated communication and protocol standards that may offer hundreds or possibly thousands of future features. Further complicating this effort is that any given utility may choose to implement a different subset of those features. This issue radically changes the meaning of "compliance" and our understanding of the concepts of "interoperability" and "plug and play".

Meter Upgradeability Standard

With all the general discussion thus far, it may be beneficial to highlight a specific example of the type of standards accomplished under NIST and the SGIP.

One of the critical issues facing electric utilities and regulators is the need to guarantee that technologies or solutions that are selected and installed by utility companies today will be interoperable and in compliance with future national standards—in other words, "future-

proof". In order to preserve their investments, utilities want to be sure that the systems they select will allow for evolution and growth as Smart Grid standards evolve.

One of the first and largest Smart Grid investments being made by many utilities is deployment of advanced metering infrastructure (AMI), with smart meters being the main component, as the primary connection between the consumer and the utility which will allow for greater participation in energy management by the ratepayer.

As a result, NIST identified the need for a meter upgradeability standard as a high priority requiring immediate attention. The objective was to define requirements for smart meter firmware upgradeability in the context of an AMI system for industry stakeholders, such as regulators, utilities, and vendors.

As noted earlier, EISA requested that NEMA support NIST in the Smart Grid effort. Even before the SGIP was created, NIST called on NEMA to develop a standard to address meter upgradeability. The NEMA SG AMI-1 smart meter upgradeability standard was developed and approved through an ANSI-accredited development process within 90 days of when NEMA's assistance was requested. This could not have been accomplished without the cooperation and work of the five major U.S. meter manufacturers, the utilities, the DOE and NIST. The success of NEMA SG AMI-1 demonstrates that standards development can be far more responsive than has historically been the case where it has often taken many years.

Promoting Exports through Standardization

The efforts made by NEMA in Smart Grid are also aimed at strengthening the export market for U.S.-manufactured products. As referenced earlier in my testimony, NEMA has taken the lead, with assistance from the Department of Commerce, to promote the U.S. Smart Grid roadmap in Mexico and Canada. NEMA is also working through the U.S. Trade and Development Agency on a Smart Grid roadmap with China. As these countries adopt the

U.S. Smart Grid architecture and standards, it opens the market for U.S.-manufactured products and technologies.

Consensus

One issue that recently surfaced within the SGIP, NIST, and FERC relates to the definition of consensus. And this definition has implications on whether and how any given standard derived through the NIST process is made mandatory by regulators, as authorized in EISA.

NEMA has been vocal about our contention that any standard coming out of an accredited standards development organization should satisfy the “sufficient consensus” clause in EISA. The procedures that NEMA must follow in order to maintain our ANSI accreditation ensure that consensus is built into every standard we publish.

Consensus is defined in many different ways. Many people, including myself, define consensus as a product or policy that “everyone can live with.” Others feel that consensus is just a super majority, such as 75%. Still others may define consensus as unanimity.

EISA states:

At any time after the Institute's work has led to sufficient consensus in the Commission's judgment, the Commission shall institute a rulemaking proceeding to adopt such standards and protocols as may be necessary to insure smart-grid functionality and interoperability in interstate transmission of electric power, and regional and wholesale electricity markets.

As stated above, in the fall of 2010, NIST sent the first five families of standards to FERC for its consideration, as directed by EISA. While the five families of standards, which dealt largely with cybersecurity, that were sent to FERC were not sanctioned by SGIP, they had

been considered by NIST with significant input from stakeholders. In January 2011, FERC held a technical conference to receive feedback on these standards.

It is NEMA's view that most if not all of the Smart Grid community felt that these five families of standards were a very good starting point. During FERC's Technical Conference, the question of whether these standards represented the consensus of the industry was responded to with skepticism by witnesses.

I believe some clarification is in order. Some may interpret the testimony presented at the Technical Conference as evidence that NIST had not fulfilled its responsibilities vis-à-vis consensus under EISA. Nothing could be further from the truth. No panelist said that the five families of standards under consideration should not be part of the Smart Grid. Further, no panelist suggested that the five families of standards did not achieve certain Smart Grid functionality. Instead, it is my view that the mere fact that it was FERC—a regulatory agency—asking the question about whether or not these standards represented consensus raised witnesses' concerns that FERC was leaning toward mandating these standards in some form.

Now, let me be clear. NEMA does not believe inclusion of a standard in the NIST Catalog of Standards should make that standard mandatory. And at least in this case, FERC agreed; in July 2011, FERC concluded it would not take action on the first five families of standards. But, NEMA does believe a standard in the Catalog is something that FERC, as well as state utility commissions, can point to as a repository of good ideas for grid operators looking for Smart Grid solutions. Indeed, the SGIP Governing Board believes the Catalog of Standards is a source, but not necessarily the sole source, for Smart Grid implementers.

What's Next?

The next area of focus for NIST and the SGIP is to establish a Roadmap for standards activities for 2012-2014. Now that the work on the first set of critical standards is under

control, we need to develop a roadmap for the next three years. This has proven to be much more difficult than expected because technologies, regulations, consumer participation really occur in stages. We need to develop an organized plan to create standards to support that staged evolution.

For example, electric vehicles represent a new and unique set of challenges to grid operators. For the first time in our electricity history, utility companies have to deal with a mobile component to the nation's electricity load. The same EV that charges in a homeowner garage overnight, could, in all likelihood, appear as a load element in an office garage or retail parking lot in a completely different part of the grid at some point later in the day. Additionally, during peak demand periods or emergencies that same vehicle could be used to return power to the grid. This kind of variability, introduced at the fringes of the grid (the utility to consumer connection) may require new standards and regulations to be seamlessly integrated with existing grid operations.

NIST's greatest role in this respect is as a resource for regulators. Given their mission and history in metrology, NIST is uniquely situated and qualified to define metrics that work for regulators and utilities and enable them to tie incentives for Smart Grid to well-defined parameters. If our objective is to promote the adoption of Smart Grid, we first have to admit that in a regulatory setting it would be virtually impossible to define the concept of "smartness;" other metrics clearly need to be defined. NEMA also encourages NIST to continue to refine its guidance in the Interagency Report on Cybersecurity. Further, NIST can work with utilities to create implementable cybersecurity plans. And NIST can work with regulators to define functional cybersecurity regulation.

Summary

Standards development for the Smart Grid is a unique and massive effort. NEMA supports the continued collaboration between the Federal government and industry to address the many standards challenges that lie ahead, including the evolution from straightforward physical standards to those requiring communications protocols and information technology.

NEMA believes NIST has responded appropriately and impressively to its responsibilities under the Energy Independence and Security Act of 2007. It has become the key facilitator for the development of Smart Grid standards.

NIST and the SGIP should continue to serve as a credible source of model standards for industry as well as the federal and state governments.

While consensus can be defined in numerous ways, NEMA believes regulatory agencies must exercise extreme caution in making the leap from a consensus standard to mandatory application of such standard.

The efforts to establish Smart Grid standards, both domestically and internationally, will create certainty, interoperability, upgradeability, and as a result will drive adoption of Smart Grid technologies, generating economic growth and creating jobs.

NEMA looks forward to working with NIST and the SGIP to develop a roadmap that will guide our standards work over the next 3 years.