On the Leading Edge: *The National Electrical Infrastructure and Smart Grid*

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Agenda

Smart Grid in the United States
- Energy Independence & Security Act
- Federal Agencies (Energy, Commerce, NIST)

Standards
- Existing & New
- NIST Conceptual Model and the Smart Grid Interoperability Panel

Global Harmonization Project

“It is the policy of the United States to support the modernization of the Nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth and to achieve each of the following, which together characterize a Smart Grid:”

1. Increase use of digital controls
2. Dynamic optimization
3. Integrate distributed resources
4. Demand Response
5. “Smart” metering
6. “Smart” appliances
7. Storage and peak shaving
8. Customer control
9. Communication Standards
10. Reduce market barriers
EISA Responsibilities

EISA

DOE
- Sec. 1302
  SG System Report
- Sec. 1303(a)
  SG Advisory Committee
- Sec. 1303(b)
  SG Task Force
- Sec. 1304(a)
  Power Grid Digital IT
- Sec. 1304(b)
  Regional Demos
- Sec. 1306
  Matching Fund Grants
- Sec. 1306(d)
  Smart Grid Functions

FERC
- Sec. 1304(a)
  Power Grid Digital IT
- Sec. 1305(d)
  Federal Jurisdiction
- Sec. 1308
  Transmission Corridor
- Sec. 1309
  Cyber Security

NIST
- Sec. 1305
  Interop Framework
- Sec. 1306
  Matching Fund Grants
- Sec. 1307
  Qual. SG Investment
- Sec. 1308
  Transmission Corridors
- Sec. 1309
  Cyber Security

States

GWAC, IEEE, NEMA, NERC, FERC

DHS, NRECA
US Department of Energy

Performance Objectives

- Metrics for Measuring Progress Toward the Implementation of the Smart Grid publication:
  - Enable active participation by consumers
  - Accommodate all generation and storage options
  - Enable new products, services, and markets
  - Provide power quality for the range of needs in a digital economy
  - Optimize asset utilization and operating efficiency
  - Anticipate and responds to system disturbances in a self-healing manner
  - Operate resiliently against physical and cyber attack and natural disasters
NIST Special Publication 1108

- Release 1.0 dated January 25, 2010
- 25 Standards identified for implementation
- 50 Standards designated for further review
- 15 Priority areas identified for new standards activity
  - Later expanded to 17
NIST Conceptual Model for Smart Grid
NIST Network Logical Diagram
25 Recommended Standards

BACNET (ASHRAE 135-2008/ISO 16484-5)
ANSI/NEMA C12 Suite: .1, .18, .19, .20, .21
ANSI/CEA 709 and CEA 852.1
LON Protocol Suite
DNP3
IEC 608760 / TASE.2
IEC 61850 Suite
IEC 61968/61970 Suites
IEEE C37.118

IEEE 1547 Suite
IEEE 1588
Internet Protocol Suite
Multispeak
Open ADR
OPC-UA Industrial
Open Geospatial Consortium
Geography Markup Language (GML)
Zigbee/Homeplug Smart Energy Profile 2.0
25 Recommended Standards, continued

Open HAN
AEIC Guidelines version 2.0
Security Profile for Advanced Metering Infrastructure v.1.0
DHS National Cyber Security Catalog of Control Systems Security
DHS Cyber Security Procurement Language for Control Systems
IEC 62530 Parts 1-8

IEEE 1686-2007
NERC CIP 002-009
NIST Special Publication (SP) 800-53, NIST SP 800-82
Selected Additional Standards

ANSI C12.22, .23, .24
GPS & SPS
Homeplug AV & Homeplug C&C
IEEE 61400-25 Communication and Control of Windpower Plants
G.Hn
IEEE P1901 - PLC
ISO/IEC 8824 & 12139-1
IEEE 802 Family
3GPP (2G, 3G, 4G Cellular) Wireless
IEEE P2030

SAE J1772 Electrical Connector
SAE J2836/1-3 Use Cases for PEV Interactions
SAE J2847/1-3 Communications for PEV
W3C
US Dept. of Transportation
NTCIP 1213 - Intelligent Transportation Systems
Cyber Security
ISA SP99, ISO 27000, NIST FIPS 140-2, OASIS WS Suite
NIST Priority Action Plans

- Smart Meter Upgradeability
  (completed)
- Internet Protocol
- Wireless Networking
- Common Price Model
- Common Scheduling
- Meter Data Profiles
- Common Semantic Model
- Electric Storage
- Distribution Management
- Demand Response
- Energy Usage Info
- Electric Transportation
- Info Mgmt. Mapping
- Time Synch
- Trans. & Dist. Models
- Power Line Carrier Communications
- Wind Plant Communications
What happens next?

NIST Governance for Smart Grid

- Smart Grid Interoperability Panel (SGIP)
  - 400+ member companies
  - 2,000 individual participants
  - Governing Board Structure
  - Charter & Elected Representation
  - Open to International Participation

- [www.SGIPweb.org](http://www.SGIPweb.org)
SGIP Structure
Cross Border Adoption/Harmonization

**US**
NIST/DOE
Framework & Roadmap
75 standards

**Canada**
NEB
Infra. 2020
Clean Energy Fund

**Mexico**
CFE, ANCE, IIE
Developing Processes

**China**
SAC, SGC
???

**EU**
CENELEC, CEN, ETSI
Manifesto

**Vision:** Globally Harmonized Standards
Cross Border Harmonization

North American Partners

- Estados Unidos
  - US Dept. of Commerce, Market Development Cooperator Program (MDCP), International Trade Administration (USTDA), National Institute of Standards and Technology (NIST), In-country Commercial Services via US Embassy
  - NEMA, Program Lead

- Mexico
  - CANENA, Comision Federal de Electricidad (CFE), ANCE, Camara Nacional de Manufacturas Electricas (CANAME), Instituto de Investigaciones Electricas (IIE)

- Canada
Overview

Title: Development of a Secure, Robust, and Reliable North American Smart Electrical Grid

ITA Entities And Other Federal Offices With Which Applicant Envisions Working: Manufacturing & Services (MAS), Market Access & Compliance (MAC), International Trade Administration (ITA) Standards Liaison, Commercial Services (CS) offices in the region, NIST, etc.

Award Period: October 1, 2009 - September 30, 2012

Foreign Markets Targeted: Mexico, Canada

Secure, Robust and Reliable North American Smart Electrical Grid
Project Activities

Activities in these three segments will be included each year for 3 years:

- Educational outreach on investment and tax policies to favor companies’ adoption of Smart Grid products;
- Expand the market through the development of interoperability standards; and
- Support utility investment in Smart Grid products and systems.
Goals

- Harmonized North American standards and installation practices for Smart Grid products.
- Continued robust growth in sales of electrical products for Smart Grid applications.
- A significant number of federal, provincial, and state government officials familiar with Smart Grid practices and standards.
- Market information documented and contacts identified.
- Understanding and commitment of utilities to the need for investment in Smart Grid products.
- Support of the Canadian and Mexican governments to invest in Smart Grid.
We will also work to compile........

- Economic analysis on the marketability of the North American Smart Grid products.
- Identification of existing state of development of the electrical grids as regards to Smart Grid in the two countries.
- Identification of the installation codes, product safety standards, and certification processes, as well as the organizations which control and/or enforce them both locally as well as nationally.
- Information on standardization and conformity assessment priorities and initiatives that affect electrical grid products.
Important Links

- www.nema.org/smartgrid
- www.nist.gov/smartgrid
- www.energy.gov

Questions?