NIST
National Institute of Standards and Technology
U.S. Department of Commerce

NIST Smart Grid Interoperability Framework

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2010 IEEE Power & Energy Society General Meeting

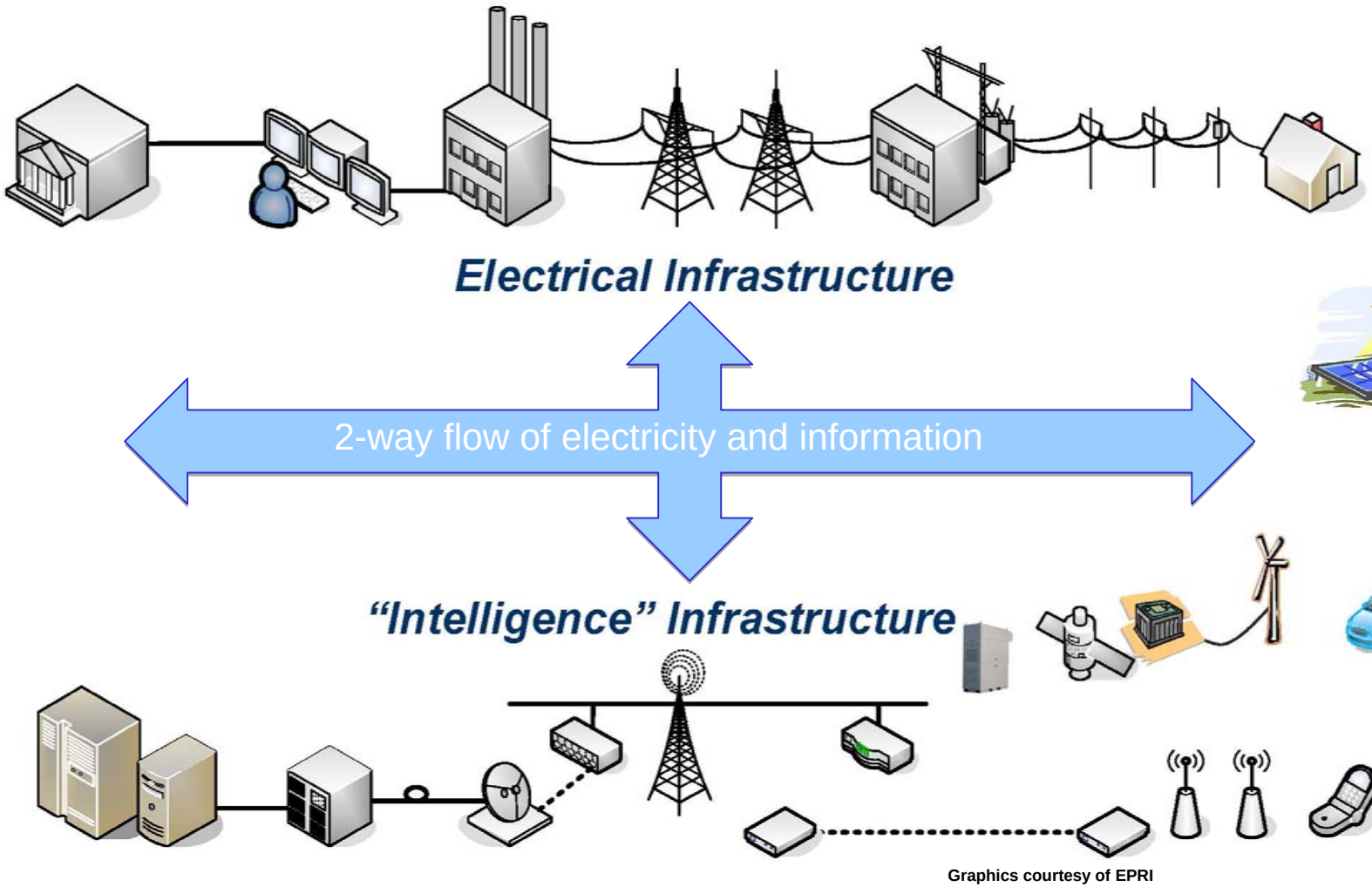
Late-Breaking News Session

July 26, 2010

Topics for Today

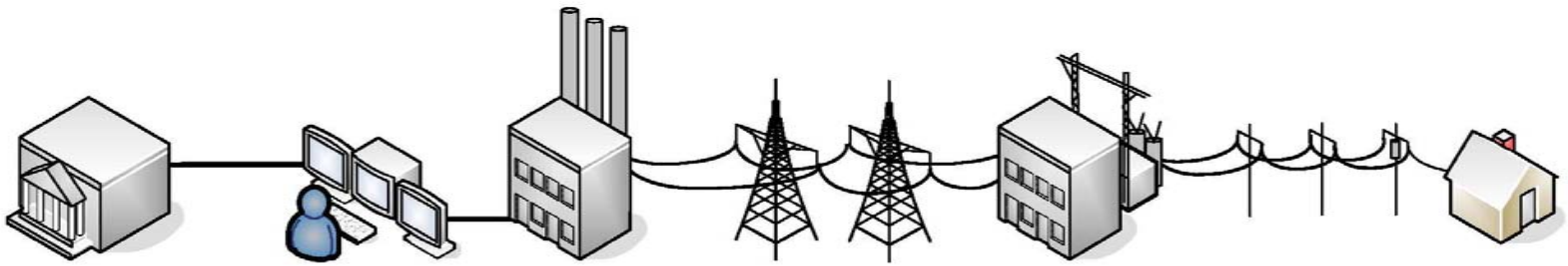
- The Role of NIST in the Smart Grid
- NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0
- Smart Grid Interoperability Panel (SGIP)
- SGIP Priority Action Plans
- Next Steps

Smart Grid = Electrical + Intelligence Infrastructures



Graphics courtesy of EPRI

Smart Grid = Electrical + Intelligence Infrastructures

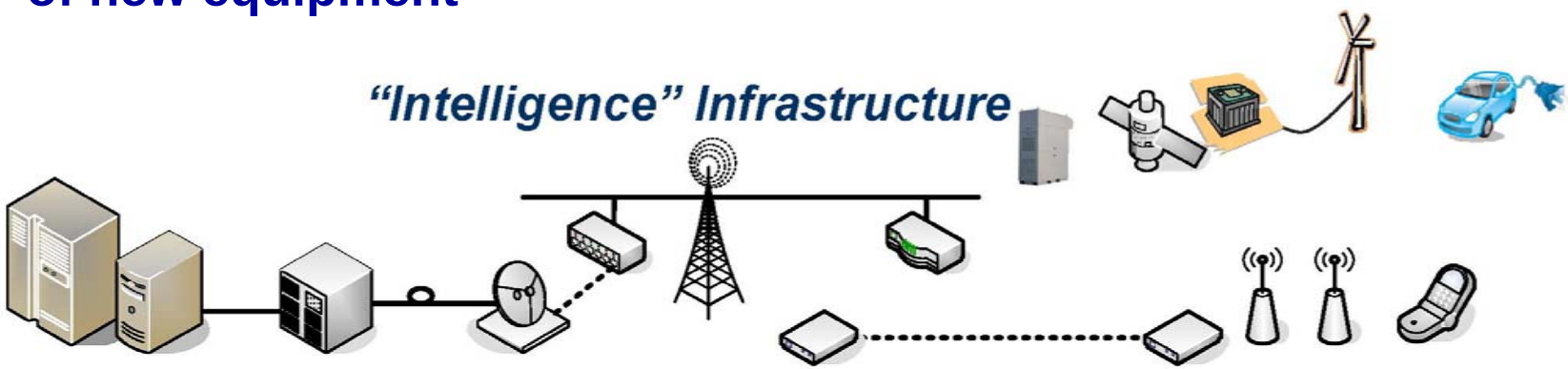


Electrical Infrastructure

Combining electrical and communication grids requires interoperability of new equipment

Interoperability requires reliable standards and validated performance

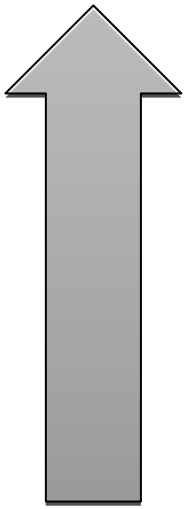
"Intelligence" Infrastructure



Graphics courtesy of EPRI

Government Roles in Smart Grid

Federal



U.S. DEPARTMENT OF ENERGY

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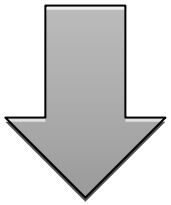
Federal Energy Regulatory Commission



State

Public Utility Commissions

National Institute of Standards and Technology Role: Coordination of Interoperability Standards in U.S.

U.S. Energy Independence and Security Act (EISA) of 2007
Title XIII, Section 1305.
Smart Grid Interoperability Framework

In cooperation with [stakeholders], **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**…"

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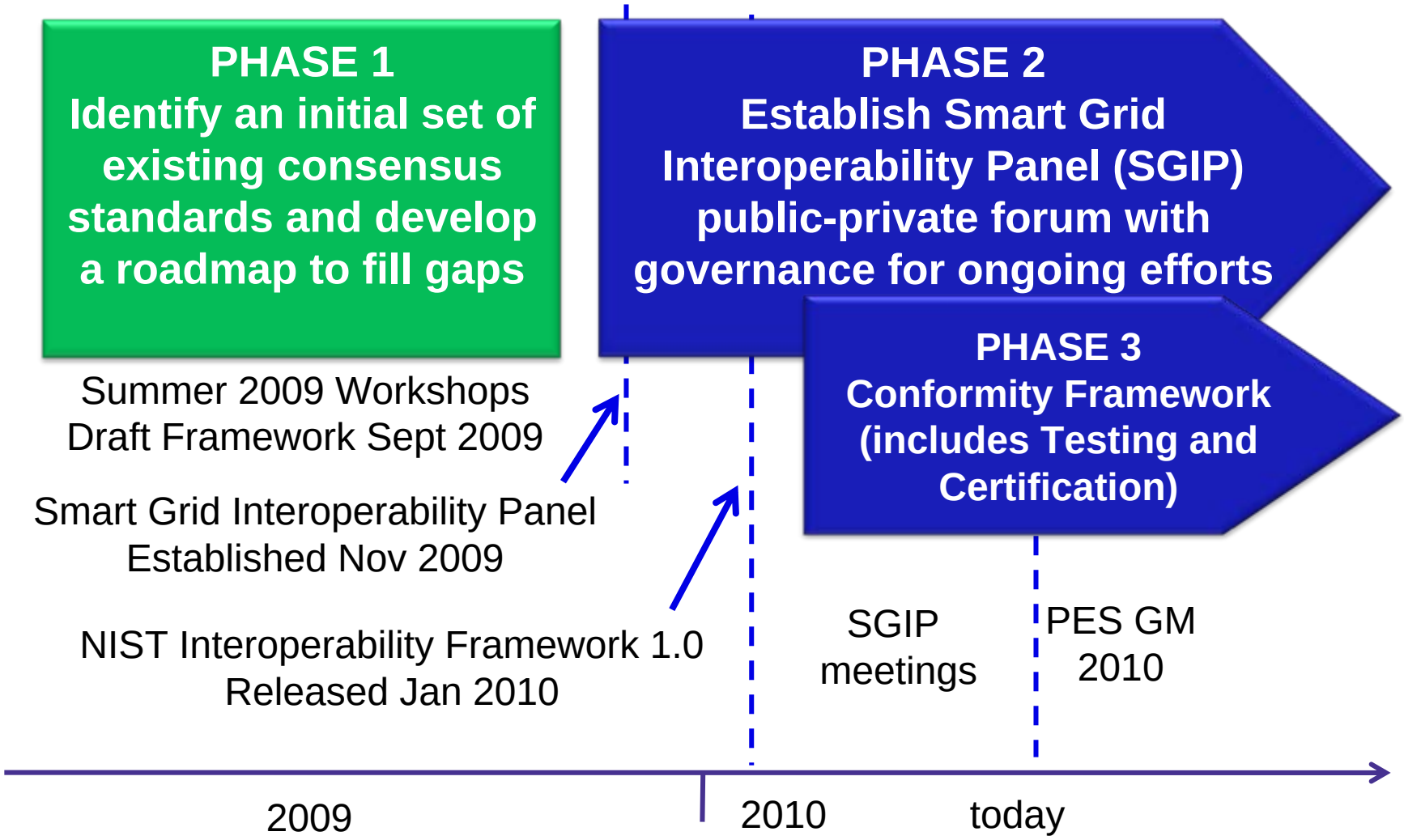
… after [NIST]'s work has led to **sufficient consensus** in [FERC]'s judgment, the **Commission** shall **institute a rulemaking proceeding** to adopt such standards and protocols…

NIST Three Phase Plan for Smart Grid Interoperability



George Arnold, NIST - National Coordinator for Smart Grid Interoperability

National Institute of Standards and Technology Role: Coordination of Interoperability Standards in United States

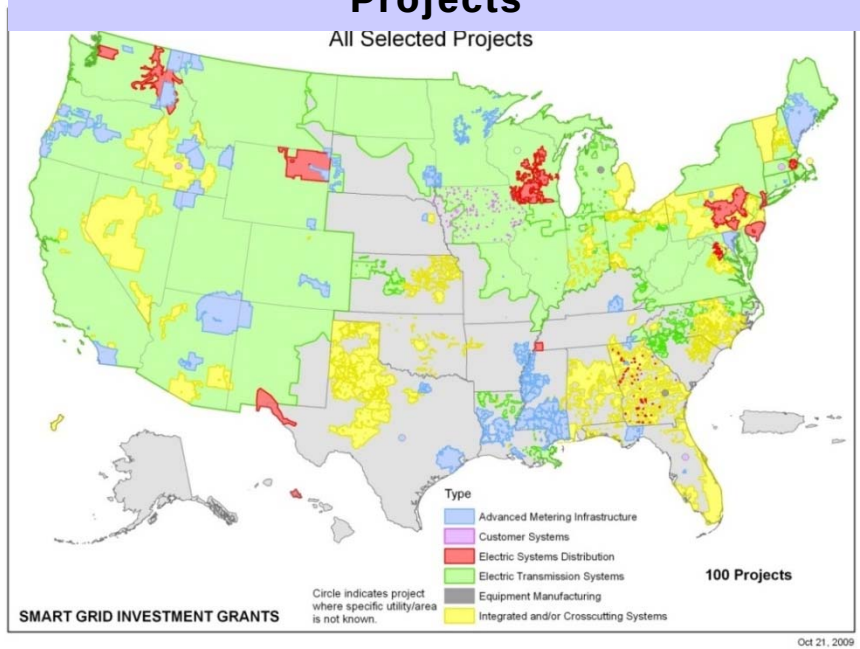
Department of Energy (DOE) lead agency for U.S. Government

- $3.4 billion of Stimulus-funded Smart Grid Investment Grants

Category	$ Million
Integrated/Crosscutting	2,150
Advanced Metering Infrastructure	818
Distribution	254
Transmission	148
Customer Systems	32
Manufacturing	26
Total	**3,429**

18M smart meters; 1.2M in-home displays
206,000 smart transformers; 877 networked phasor measurement units; 671 automated substations
177,000 load control devices; 170,000 smart thermostats; 100 PEV charging stations

Geographic Coverage of Selected Projects



NIST National Institute of Standards and Technology

NIST Framework and Roadmap, Release 1.0

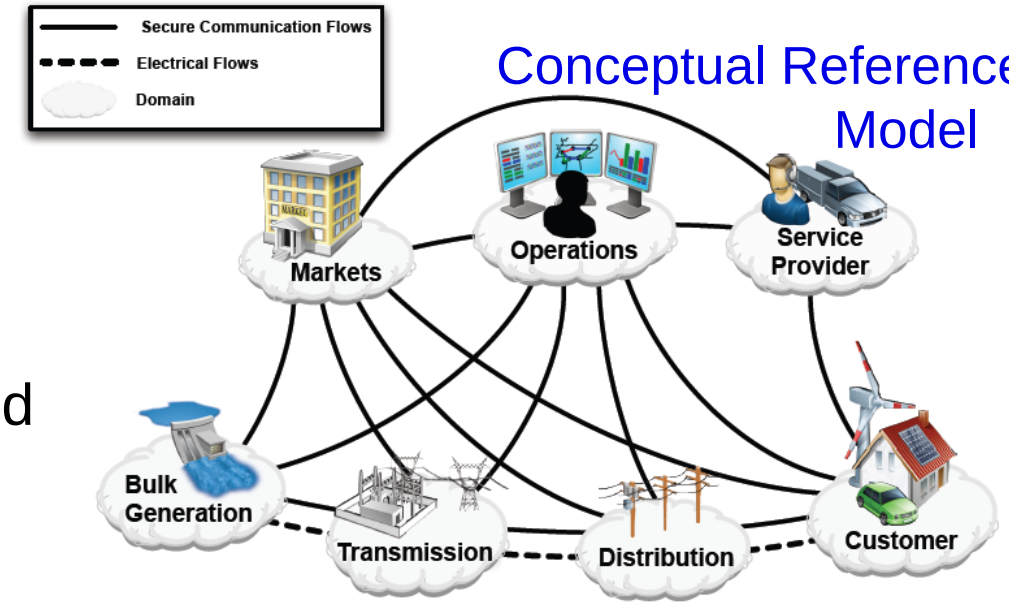
- Revised version Jan 19, 2010
- Smart Grid Vision / Model
- 75 key standards identified
  - IEC, IEEE, …
- 16 Priority Action Plans to fill gaps (one completed)
- Cyber security strategy
  - Companion document NISTIR 7628
- Next steps – keep standards acceleration going strong!
- Public comments reviewed and addressed

NIST Special Publication 1108

http://www.nist.gov/smartgrid/

NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0

Conceptual Reference Model



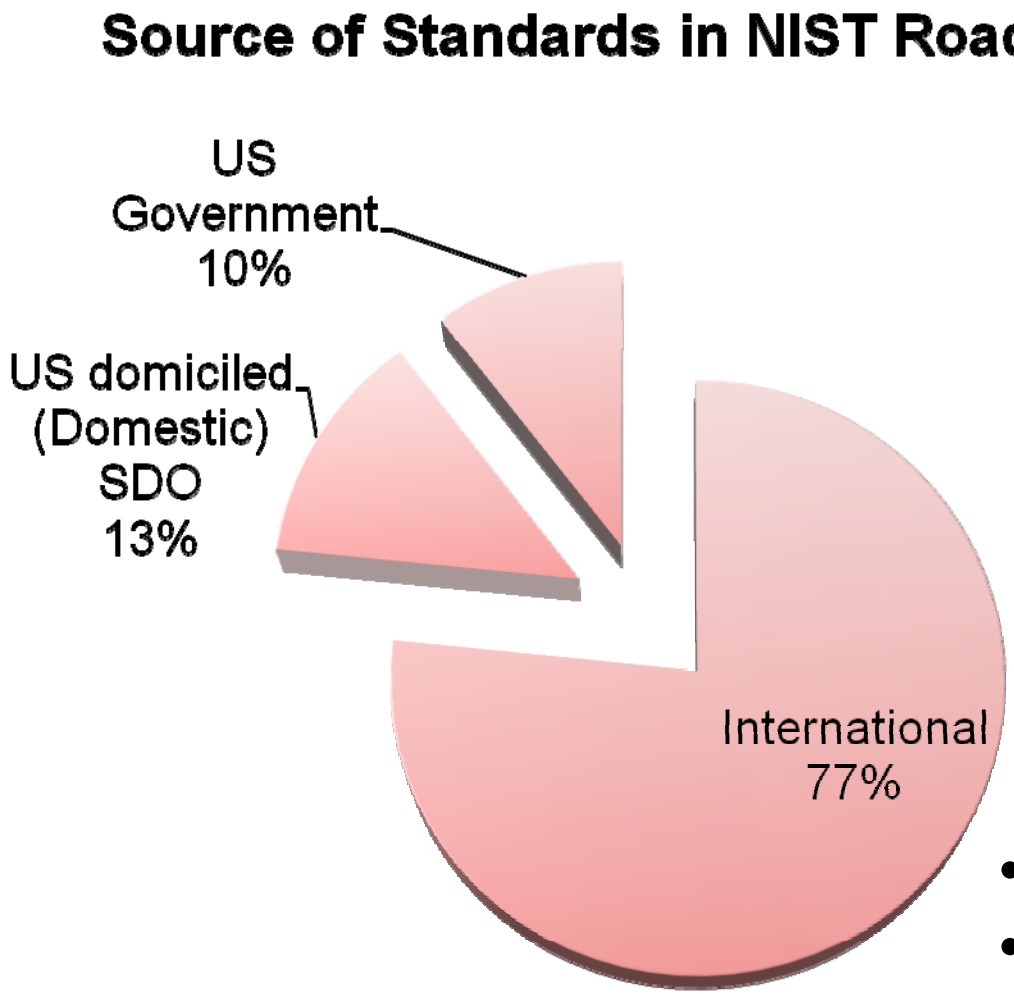
NIST Smart Grid Framework 1.0 January 2010

NIST National Institute of Standards and Technology

Standards Acceptance Criteria

- ***Enables Smart Grid characteristics*** as defined by EISA, DOE Smart Grid System Report
- Is applicable to one of the ***priority areas*** identified by FERC and NIST
- ***Enables the transition*** of the legacy power grid to the Smart Grid.
- Is an ***open, stable and mature*** industry-level standard developed in consensus processes from a standards development organization
- Is supported by an ***SDO or Users Group*** to ensure that it is regularly revised and improved to meet changing requirements and that there is strategy for continued relevance.
- Is ***openly available*** under fair, reasonable, & nondiscriminatory terms.
- Is developed and adopted ***internationally,*** wherever practical

International Standards are Vital



- IEC/ISO/ITU
- IETF
- IEEE/SAE/ISA
- Global consortia

What are Priority Action Plans (PAPs)?

NIST workshops identified priority standards issues

- many standards require revision or enhancement
- and new standards need to be developed to fill gaps

A total of 70 priority standards issues were identified in the EPRI report

NIST determined which require most urgent resolution and selected top 14 to initiate PAPs

The August SDO Workshop was used to develop the action plan for each priority issue.

Current status for each PAP is posted on the NIST website

- broad SDO and stakeholder support and participation
- aggressive milestones in 2009 or early 2010 established

The Smart Grip Interoperability Panel will guide oversee progress on PAPs and development of new PAPs.

NIST Priority Action Plans address standards gaps

Priority Action Plans
Smart meter upgradeability standard (PAP 00, completed in 2009)
Standard meter data profiles (PAP 05)
Develop common specification for price and product definition (PAP 03)
Develop common scheduling communication for energy transactions (PAP 04)
Standard demand response signals (PAP 09)
Customer energy use information (PAP10)
Energy storage interconnection guidelines (PAP 07)
Interoperability standards to support plug-in electric vehicles (PAP 11)
Wind Interconnection Standards (PAP 16)

Priority Action Plans
Guidelines for use of IP protocol suite in the Smart Grid (PAP 01)
Guidelines for the use of wireless communications (PAP 02)
Harmonize power line carrier standards for appliance communications in home (PAP15)
Develop common information model (CIM) for distribution grid management (PAP 08)
DNP3 Mapping to IEC 61850 Objects (PAP12)
Transmission and distribution power systems model mapping (PAP 14)
Harmonization of IEEE C37.118 with IEC 61850 and Precision Time Synchronization (PAP 13)

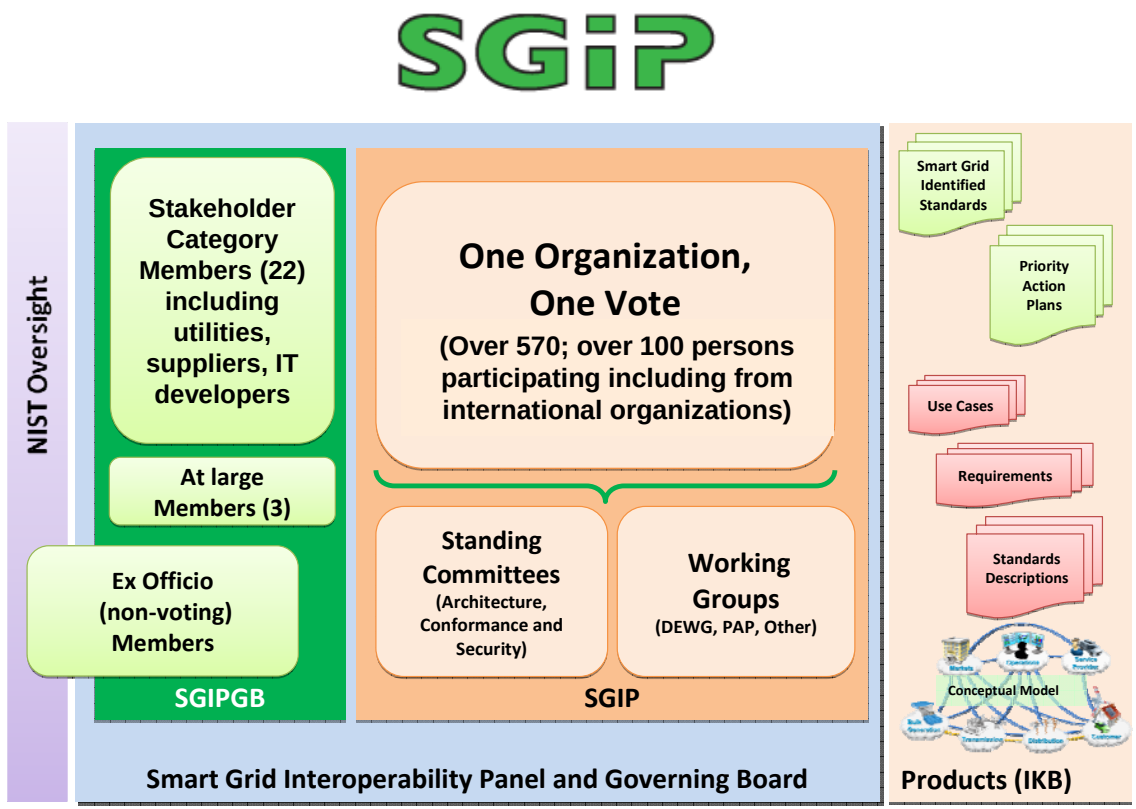
Accomplishments

PAP highlights

- PAP 1 – Role of IP in Smart Grid
  - “ANSI C12.22, IEEE 1703, and MC12.22 Transport over IP” specification to be issued with numbered IETF RFC – Jul/Aug 2010
- PAP 2 – Wireless Communications for the Smart Grid
  - Wireless capability matrix for Smart Grid applications was completed. NISTIR expected September
- PAP 7 – Electric Storage Interconnection Guidelines
  - IEEE 1547.8 team formed, coordinating with IEC 61850-7-420 standards
- PAP 10 – Standard Energy Usage Information
  - On path for NAESB standard by end of 2010
- PAP 12 – IEC 61850 Objects/DNP3 Mapping
  - IEEE 1815 standard released for DNP3

Smart Grid Interoperability Panel (SGIP)

- Public-private partnership, started in Nov. 2009
- Over 600 organizations, over 1600 individual members
- Supports NIST in coordinating standards
- Committees established, SGIP meetings ongoing
- Electronic collaboration tools, newsletters / communications
- Project management office
- Open, transparent process
- International participation welcome



International Smart Grid Coordination

Close coordination with International Standards Developing Organizations (SDOs) through NIST process

- IEC, ISO, ITU-T, IETF, IEEE participating in SGIP
- Example: IEC work coordinated with NIST through liaison with IEC Strategic Group 3

Bilateral engagements with Japan, EU, Canada, Mexico, Brazil, Korea, China, Australia, India, …

Partnering with U.S. Dept. of Energy and U.S. State Dept. on a proposed multi-lateral intergovernmental International Smart Grid Action Network (ISGAN)

Smart Grid: Major Issues/Challenges

- Standards for customer access to energy usage information
- Home Area Network interaction with the Smart Grid
- Competing electric vehicle standards for rapid charging
- Defining sound architectural principles for SG – just beginning, but needed yesterday. Potential overlaps emerging among IEEE, IEC, ITU-T, ETSI in developing architecture documents.
- Ensuring security aspects are considered at every level
- Education, demonstration of consumer benefit

U.S. New Policy Initiatives

National Science and Technology Council (White House level)

- Committees on Environment and Natural Resources, Homeland and National Security, Science, and Technology

- Committee on Technology:
  - NEW Subcommittee on Standards
    - Co-chairs are NIST Director, Department of Justice
  - NEW Subcommittee on Smart Grid Policy
    - Chair is Department of Energy (Office of Electricity, …)
    - Vice-chair is NIST Coordinator, Smart Grid Interoperability

NIST Smart Grid Advisory Committee

- will advise the Director of NIST in carrying out duties authorized by the 2007 EISA
- will provide input to NIST on the Smart Grid Standards, Priorities and Gaps
- 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
- input to NIST will be used to help guide Smart Grid Interoperability Panel activities and also assist NIST in directing research and standards
- 9-15 members appointed by the NIST Director reflect the wide diversity of technical disciplines involved in the Smart Grid deployment and operations
- Federal Register Notice - nominations for the initial Committee are now under consideration

Next Steps

- Post narrative summaries of identified Smart Grid standards (late summer 2010)
- Stand up Smart Grid Advisory Committee (Fall 2010)
- NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 2.0 (Jan 2011)
- SGIP Plenary and Governing Board Meetings (September and November, 2010)
- SGIP Working Groups, Committees (ongoing)

Web links and contacts

NIST main web portal: www.nist.gov/smartgrid

NIST Smart Grid Twiki: http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/WebHome

SGIP Website: http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIP

Interoperability Knowledge Base (IKB) standards catalog website: http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIPCatalogOfStandards

DOE Smart Grid Site: http://www.oe.energy.gov/smartgrid.htm

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