

NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 2.0

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*Electric Grid Modernization (Smart Grid) – Current Standards
Development & Cyber Security Work*

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Topics for Today

- Energy Independence and Security Act (EISA) Mandate
- SGIP
- Draft NIST Framework and Roadmap, Release 2.0

Smart Grid – A U.S. National Priority

“It is the policy of the United States to support the modernization of the Nation's electricity [system]... to achieve...a Smart Grid.”
Congress, Energy Independence and Security Act of 2007

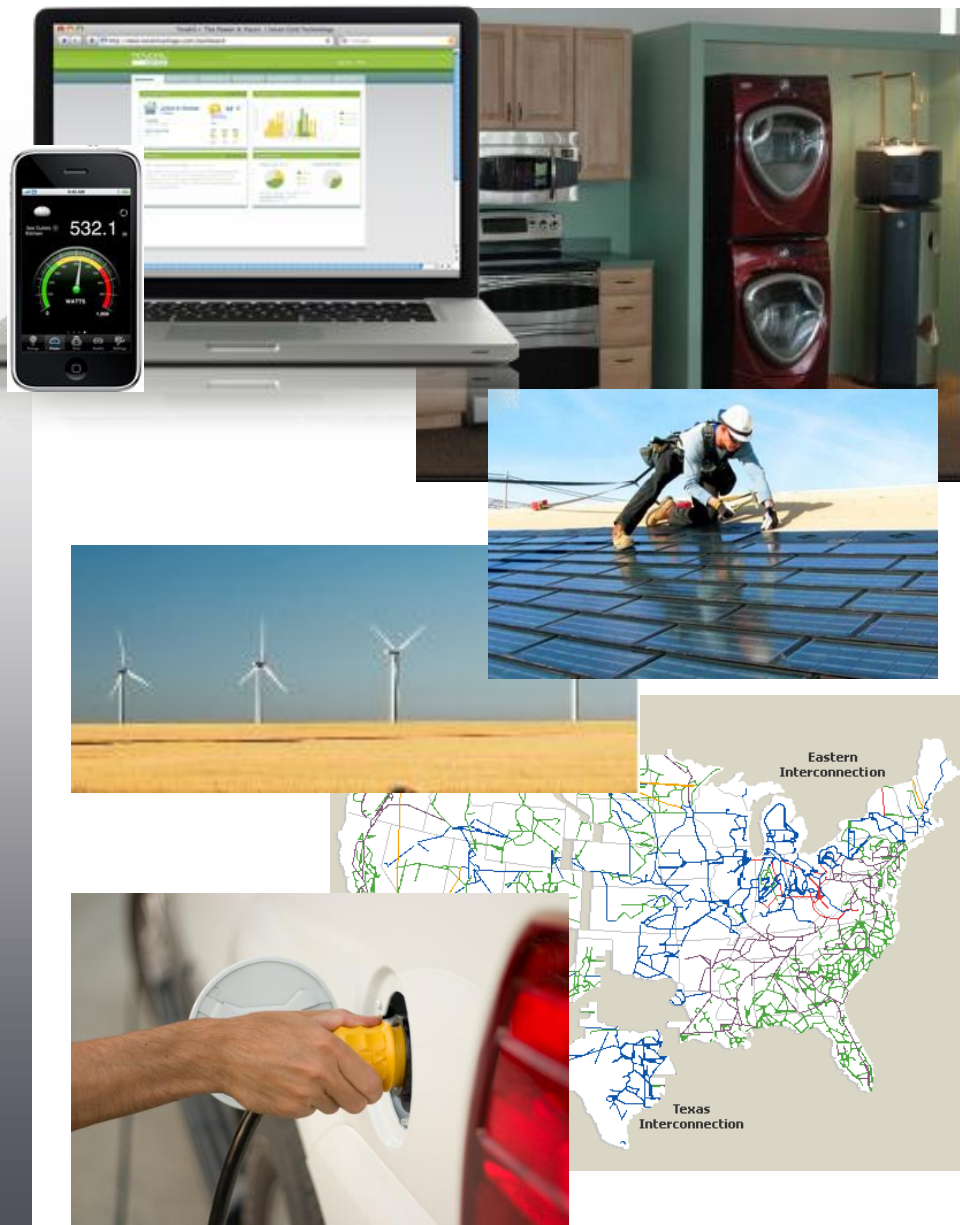


“We’ll fund a better, smarter electricity grid and train workers to build it...”
President Barack Obama

“To meet the energy challenge and create a 21st century energy economy, we need a 21st century electric grid...” Secretary of Energy Steven Chu

“A smart electricity grid will revolutionize the way we use energy, but we need standards ...” Former Secretary of Commerce Gary Locke, now U.S. Ambassador to China

What is the Smart Grid?



The Smart Grid integrates information technology and advanced communications into the power system in order to:

Increase system efficiency and cost effectiveness

Provide customers tools to manage energy use

Improve reliability, resiliency and power quality

Enable use of innovative technologies including renewables, storage and electric vehicles

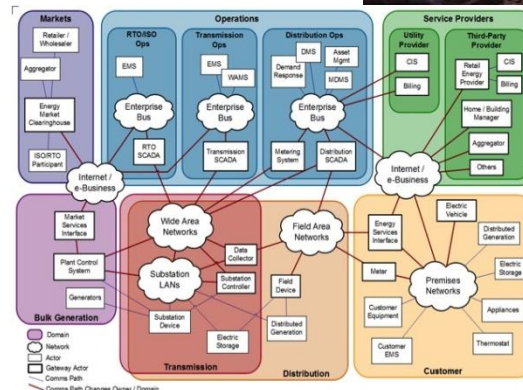
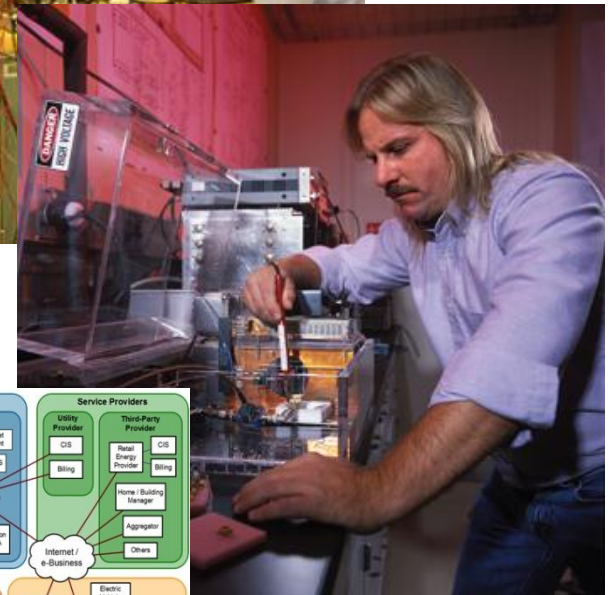
NIST Roles in the Smart Grid

Measurement research

- Power and Energy Measurements (Meters)
- Wide area monitoring (synchrophasors)
- Power conditioning (power electronics)
- Building energy management (EMS)
- Electricity storage (ultracapacitors)

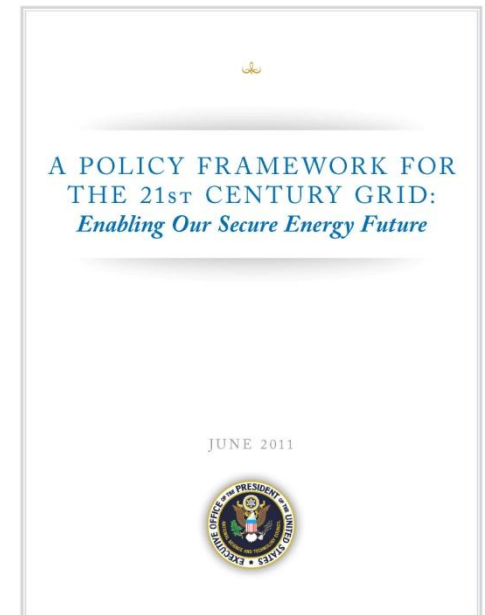
Standards (EISA role)

- Interoperability
- Cybersecurity



Smart Grid – A U.S. National Policy

- The 2007 Energy Independence and Security Act (EISA) lays out a national policy for the Smart Grid in the U.S.
 - The Act assigned NIST the primary responsibility to coordinate development of standards for the Smart Grid
- The White House National Science and Technology Council has established a Smart Grid Subcommittee
 - The Subcommittee produced a report that lays out the Administration's policy on Smart Grid
- Key Federal policy recommendations:
 - Enable cost-effective smart grid investments
 - Unlock innovation
 - Empower and inform consumers
 - Secure the grid



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.*

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...**”

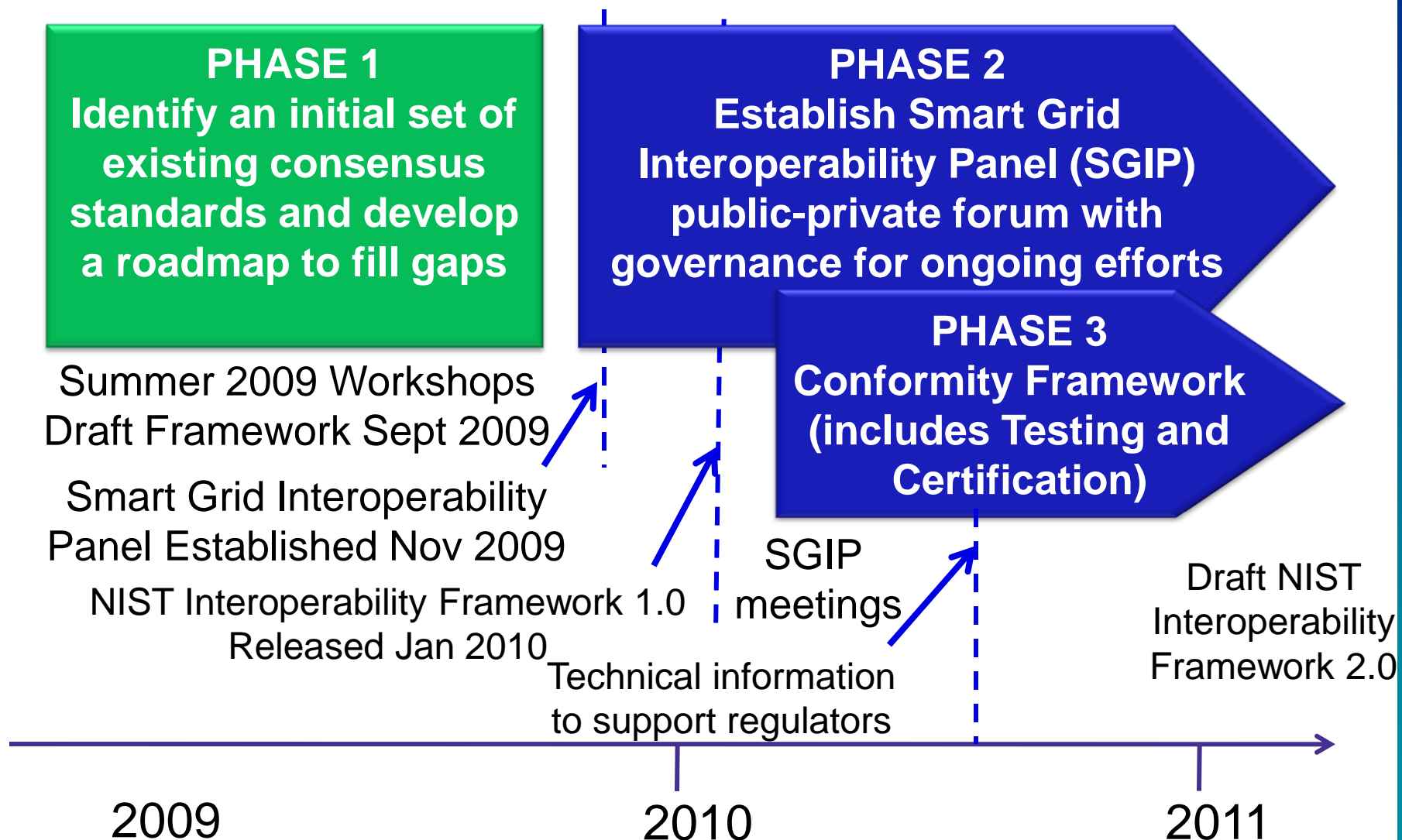
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... after [NIST]’s work has led to **sufficient consensus** in [FERC]’s judgment, the **Commission** shall **institute a rulemaking proceeding** to adopt such standards and protocols **as may be necessary** to insure smart-grid functionality and interoperability ...

NIST Three Phase Plan for Smart Grid Interoperability



Smart Grid Interoperability Panel (SGIP)

SGIP GB and SGIP Charter

“The Smart Grid Interoperability Panel (SGIP) is a membership-based organization ... 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. “



Smart Grid Interoperability Panel

Public-private partnership created in Nov. 2009

Over 700 member organizations, 1700 participants

Open, public process with international participation

Coordinates standards development

- Identifies Requirements
- Prioritizes standards development programs
- Works with over 20 SDOs including IEC, ISO, ITU, IEEE, ...

Web-based participation



SGIP Twiki:

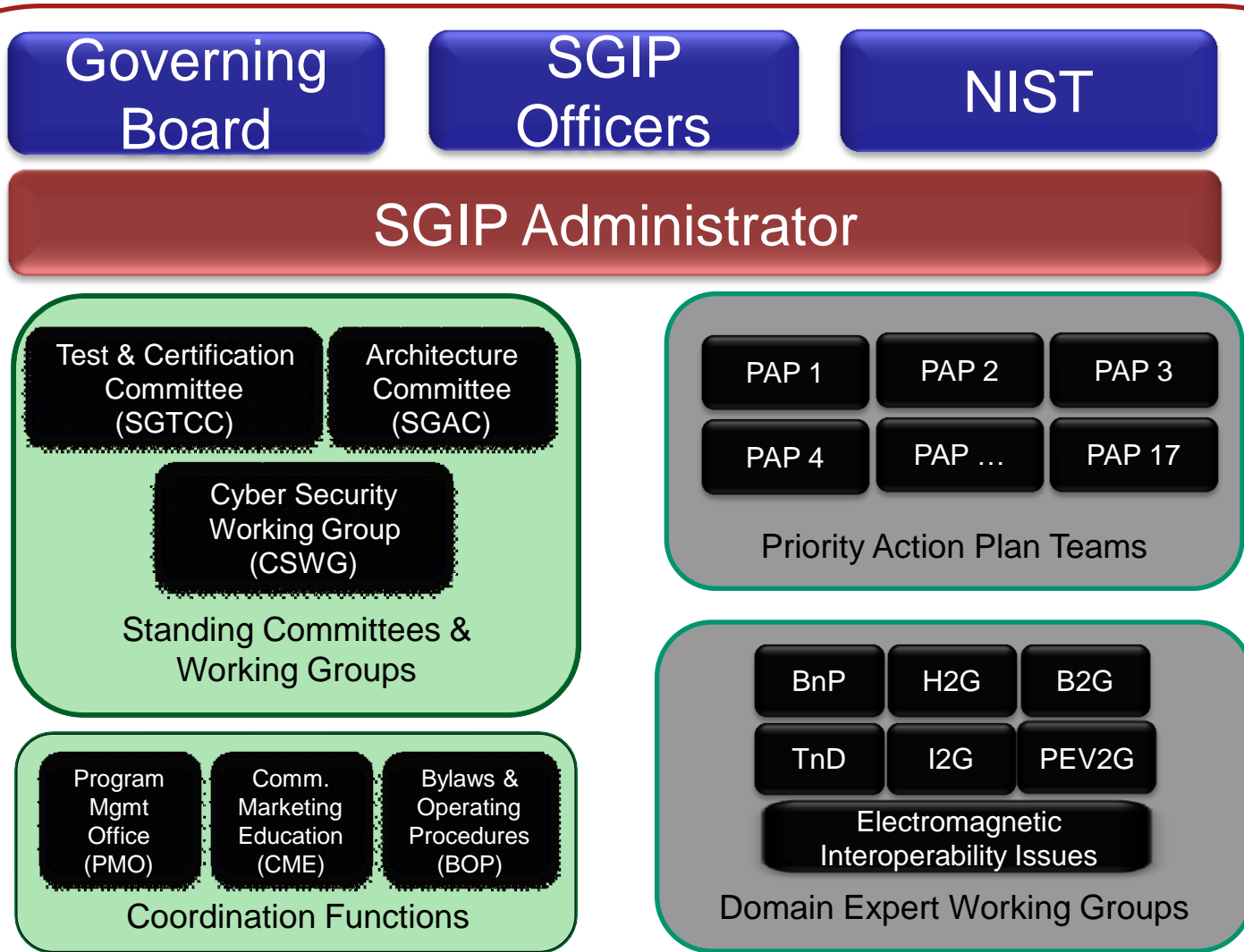
<http://collaborate.nist.gov/twiki-ssgrid/bin/view/SmartGrid/SGIP>

SGIP Stakeholder Categories

1	Appliance and consumer electronics providers	12	Power equipment manufacturers and vendors
2	Commercial and industrial equipment manufacturers and automation vendors	13	Professional societies, users groups, and industry consortia
3	Consumers – Residential, commercial, and industrial	14	R&D organizations and academia
4	Electric transportation industry Stakeholders	15	Relevant Government Agencies
5	Electric utility companies – Investor Owned Utilities (IOU)	16	Renewable Power Producers
6	Electric utility companies - Municipal (MUNI)	17	Retail Service Providers
7	Electric utility companies - Rural Electric Association (REA)	18	Standard and specification development organizations (SDOs)
8	Electricity and financial market traders (includes aggregators)	19	State and local regulators
9	Independent power producers	20	Testing and Certification Vendors
10	Information and communication technologies (ICT) Infrastructure and Service Providers	21	Transmission Operators and Independent System Operators
11	Information technology (IT) application developers and integrators	22	Venture Capital



Organization



SGIP Membership

NIST Smart Grid Federal Advisory Committee

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
National Electrical Manufacturers Association (NEMA)

Lawrence E. Jones
Director, Strategy and Special Projects Worldwide
ALSTOM Grid

Suedeem 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

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

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)

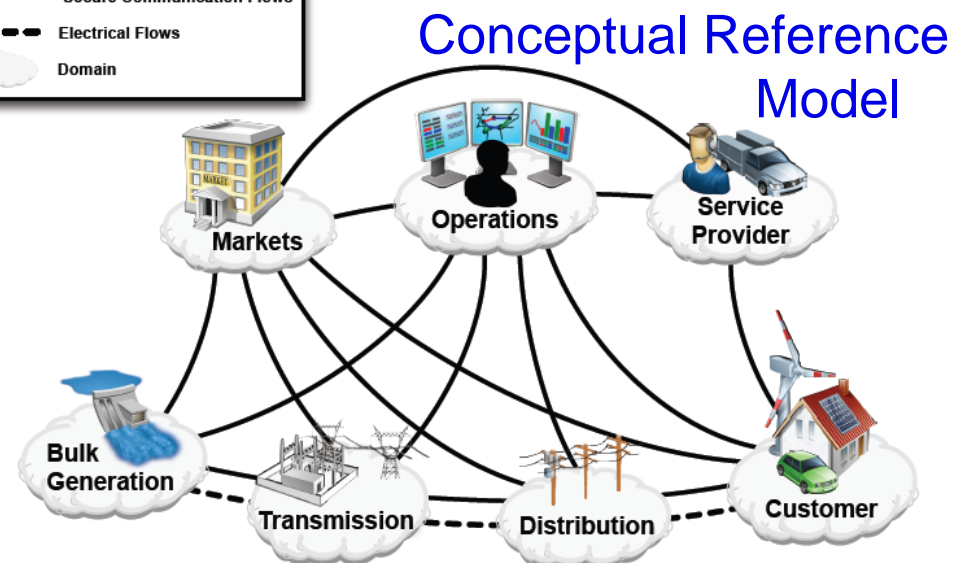
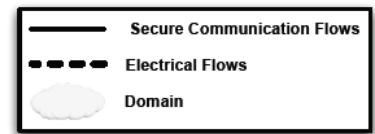
Cyber security strategy

- 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



NIST Smart Grid Framework 1.0 January 2010

Filling Gaps in the Standards

Priority Action Plans (led by NIST staff)

#	Priority Action Plan	#	Priority Action Plan
0	Meter Upgradeability Standard	9	Standard DR and DER Signals
1	Role of IP in the Smart Grid	10	Standard Energy Usage Information
2	Wireless Communication for the Smart Grid	11	Common Object Models for Electric Transportation
3	Common Price Communication Model	12	IEC 61850 Objects/DNP3 Mapping
4	Common Scheduling Mechanism	13	Time Synchronization, IEC 61850 Objects/ IEEE C37.118 Harmonization
5	Standard Meter Data Profiles	14	Transmission and Distribution Power Systems Model Mapping
6	Common Semantic Model for Meter Data tables	15	Harmonize Power Line Carrier Standards for Appliance Communications in the Home
7	Electric Storage Interconnection Guidelines	16	Wind Plant Communications
8	CIM for Distribution Grid Management	17	Facility Smart Grid Information
		18	SEP 1.x to SEP 2.0 Transition and Coexistence

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NIST Framework for Interoperability Standards, Release 2.0 (R2.0)

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1. Purpose and Scope
 2. Smart Grid Vision
 3. Conceptual Architectural Framework
 4. Standards Identified for Implementation
 5. SGIP
 6. Cybersecurity Strategy
 7. Framework for Testing and Certification
 8. Next Steps
 9. List of Acronyms
- Appendix – Specific Domain Diagrams

<http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/IKBFramework>

NIST Framework, Release 2.0,

Chapter 1. Purpose & Scope

Chapter 2. Smart Grid Visions

Use of the Framework Document

- Utilities and suppliers
 - Conceptual Architectural Framework (Chapter 3), compendium of reference standards (Chapter 4), Smart Grid privacy and security (Chapter 6); a taxonomy of the various Smart Grid domains (Appendix)
- Testing laboratories and certification organizations
 - New T&C (Chapter 7)
- Academia:
 - Next Steps (Chapter 8) and summaries of various Priority Action Plan (PAP) subgroups' efforts in Chapter 5
- Regulators:
 - a general introduction to the SG (Executive Summary and Chapter 1), a guide to workable standards (Chapter 4), Smart Grid privacy and security matters (Chapter 6)

NIST Framework, Release 2.0, Chapter 1. Purpose & Scope, Chapter 2. Smart Grid Visions

Smart Grid - a national policy goal

- EISA
 - NIST 3-phase plan; NIST Framework, R1.0; SGIP
- NSTC report “*A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future.*”
 - greater focus on standards achieve innovation.

International Cooperation

- International Smart Grid Action Network (ISGAN)
- ARCAM
 - Provide recommendations for actions APEC members to prevent trade barriers related to Smart Grid interoperability standards.

FERC Order

- **FERC Technical Conference on Interoperability**

Standards, January 31, 2011

- Is there consensus on SG interoperability standards (five families of IEC standards from NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0)?
- IEC 61850, 61968, 61970, 60870-6, 62351
- public comment period

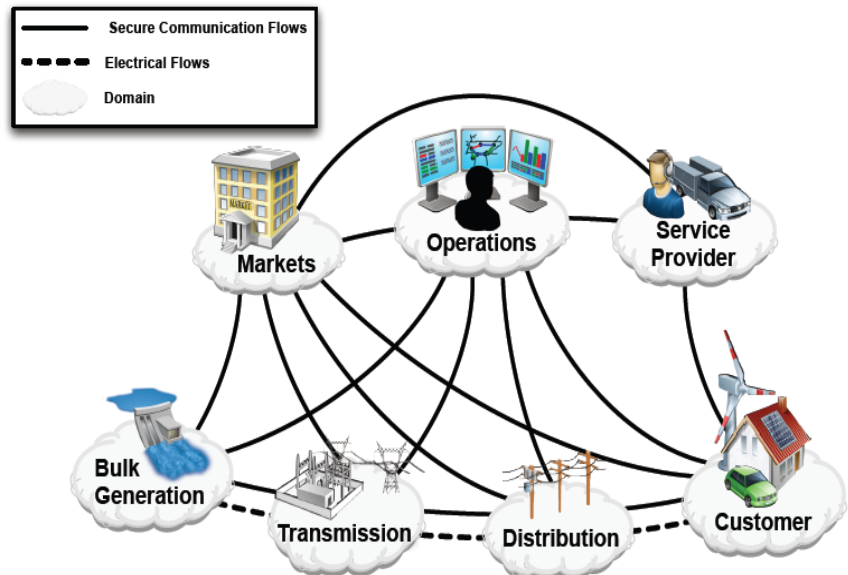
FERC Order, July 20, 2011

- **will not institute a rulemaking on standards:**
 - lack of consensus, cyber security concerns, risk of unanticipated consequences of premature implementation
- **supports the NIST interoperability framework process**, including the work done by SGIP, for development of smart grid interoperability standards.
- **cites the NIST Framework as comprehensive and representing the best vehicle** for developing standards for the smart grid.
- **encourages SG stakeholders to actively participate** in and look to the NIST-coordinated process for guidance on smart grid standards.

NIST Framework, Release 2.0, Chapter 3. Conceptual Architecture Framework

Update on work being done by the SGAC:

- Standards Review by the Smart Grid Architecture Committee
- Legacy Integration and Legacy Migration
- Common Understanding of Information
- Conceptual Business Services



NIST Framework, Release 2.0,

Chapter 4. *Standards Identified for Implementation*

Updates to Table 4-1

- Standards moved from Table 4-2, (for further review) to Table 4-1 (identified standards).
 - emerged from the PAPs, recommended by the SGIP GB, and approved by the SGIP plenary for the SGIP CoS:
 - IETF Internet Protocol Standards for Smart Grid – RFC 6272 (PAP1)
 - NAESB WEQ19, REQ18, Energy Usage Information (PAP10)
 - SAE J1772, J2836 EV Standards (PAP11)
 - NEMA Smart Meter Upgradeability Standard SG-AMI 1 (PAP0)
 - Guidelines for Assessing Wireless Standards for for SG Applications, NIST IR 7761 (PAP02)
- Guidelines from SGIP Committees
 - SGTCC Interoperability Process Reference Manual (IPRM)
 - NISTIR 7628 Guidelines for SG Cybersecurity

NIST Framework, Release 2.0,

Chapter 4. *Standards Identified for Implementation*

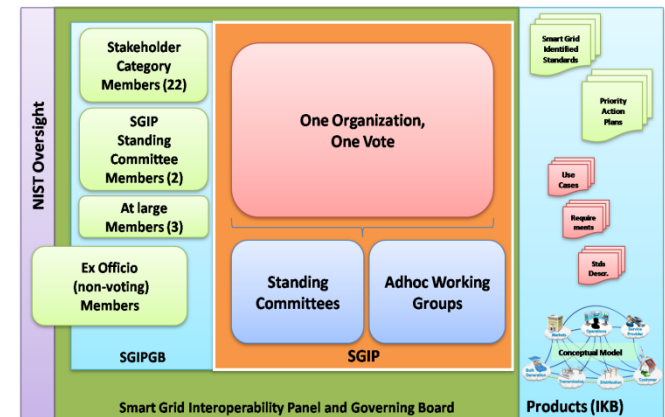
Updates to Table 4-2

- Standards that did not exist in January 2010
 - OASIS Energy Interoperation (EI) (PAP9)
 - ASHRAE 201P Facility Smart Grid Information Model (PAP17)
- Standards recommended for review by SGIP WGs
 - EMI and EMC standards from EMI WG
- Future additions/changes:
 - Using the CoS as a major source of input for the NIST Framework

NIST Framework, Release 2.0, Chapter 5. *SGIP*

Guide to the SGIP

- Purpose and structure
 - SGAC, SGTCC, CSWG, DEWGs
- PAPs
 - 19 and counting
- Future changes to SGIP
 - Reliability, safety, and implementability reviews for CoS under discussion/development



NIST Framework, Release 2.0, Chapter 6. *Cybersecurity*

CSWG

- Structure, subgroups, major outputs and activities
 - NISTIR 7628
 - CoS Standards Reviews
 - CSWG 3-year plan
- Future activities
 - Risk management framework

NIST Framework, Release 2.0,

Chapter 7. *Testing and Certification*

Framework for SG Interoperability T&C

- Phase III of NIST plan
- Major efforts:
 - Existing Conformity Assessment Program Landscape
 - evaluated testing and conformity assessment programs for 31 SG standards
 - SG T&C framework development guide
 - presents scope, rationale, and need for developing a comprehensive framework and action plan for SG interoperability T&C
- IPRM – for adoption by ITCAs
 - specifies the mandatory T&C and certification processes for achieving interoperability

NIST Framework, Release 2.0,

Chapter 8. Next Steps

Framework and Interoperability Standards Evolution

- The framework will continue to evolve as Smart Grid deployments are rolled out, innovative technologies emerge, and new standards needs and issues are identified
- Support the implementation of the policies set out in the NSTC report by continuing to catalyze the development and adoption of open standards
- Take "lessons learned" from DoE SGIG deployments to further identify standards needs, and work with SGIP, SSOs, and other stakeholders to fill the gaps and improve the standards that form the foundation of the Smart Grid.
- Continue efforts in coordination of development of international standards with organizations

Input from the SG Stakeholders IP

- Draft Release 2.0 Framework & Roadmap document now posted
<http://collaborate.nist.gov/wiki-sggrid/bin/view/SmartGrid/IKBFramework>
- FRN for public comment solicitation in next few weeks
- Comments received will be reviewed with SGIP
- Release 2.0 Framework posted in late Fall

Thank You!

Web portal: <http://www.nist.gov/smartgrid>

NIST Interoperability Framework, Release 2.0:

<http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/IKBFramework>

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