NIST Interoperability Framework and Action Plans

Evan Wallace

National Institute of Standards and Technology (NIST)

Gaithersburg, MD 20899

ewallace@nist.gov

CIM Role in Smart Grid for Transmission and Distribution Meeting

**Smart Grid and the CIM Session**

September 8, 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
- Relationship to CIM and IEC TC57
- Next Steps

Smart Grid Drivers and Goals

- Climate change
- Energy security
- Lifestyle dependent on electricity
- Jobs
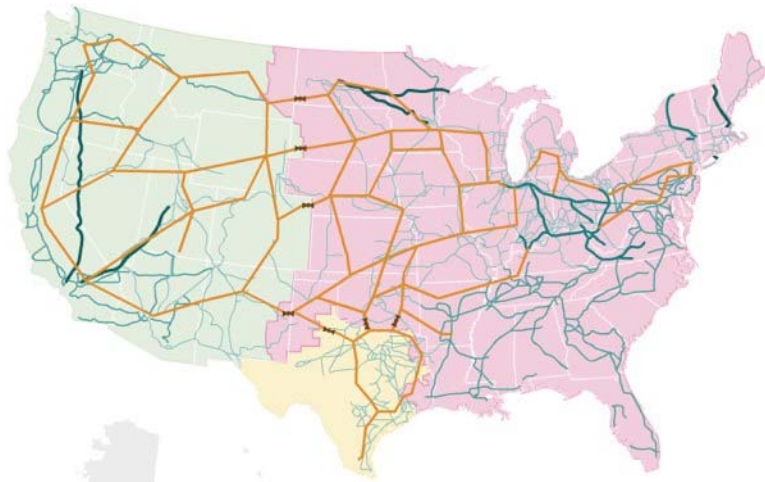
- Reduce energy use overall and increase grid efficiency
- Increase use of renewables (wind and solar don't produce carbon)
- Support shift from oil to electric transportation
- Enhance reliability and security of the electric power system
- World-wide equipment and services market

Smart Grid = Electrical + Intelligence Infrastructures

Electrical Infrastructure

2-way flow of electricity and information

"Intelligence" Infrastructure

Graphics courtesy of EPRI
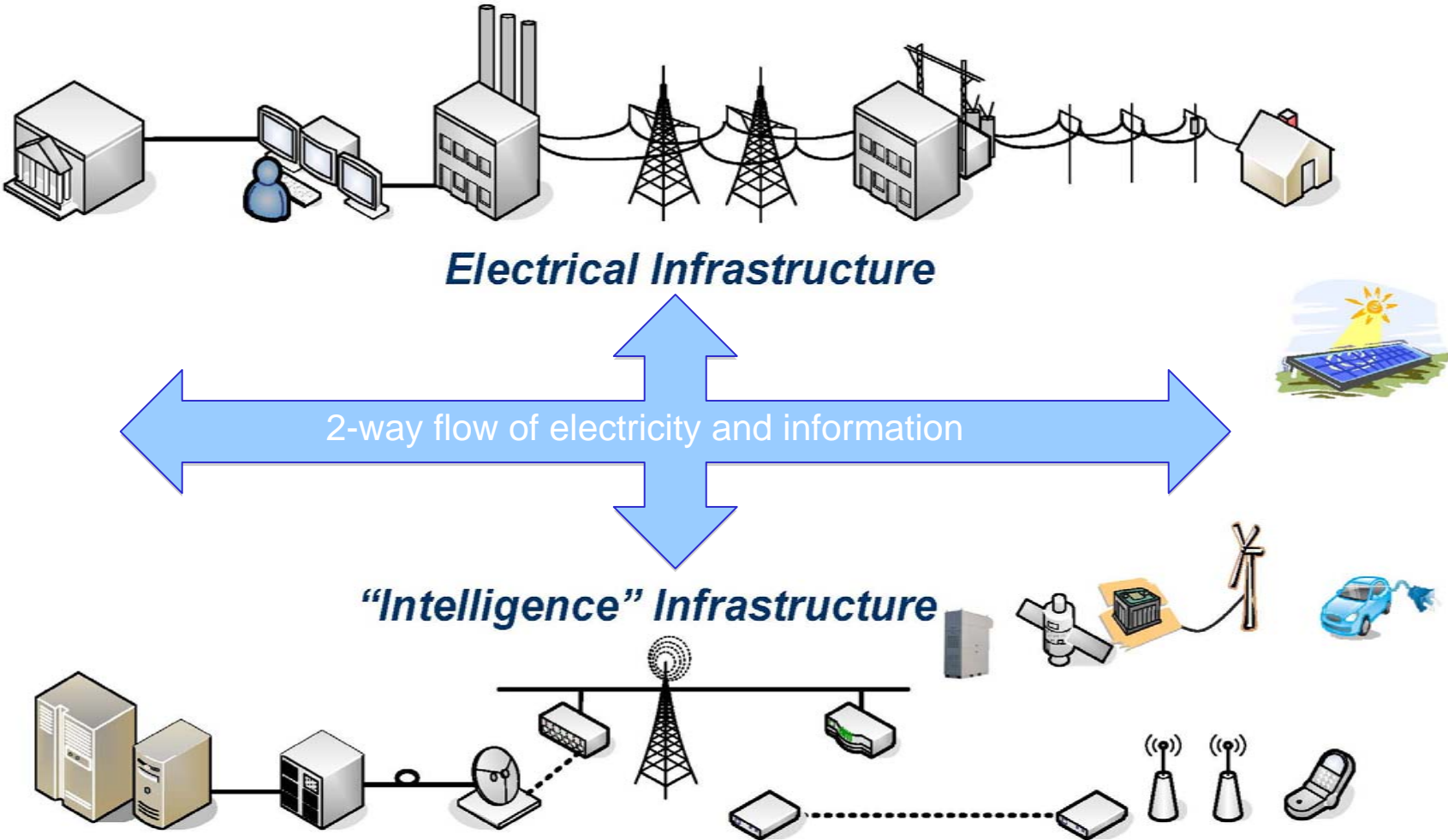
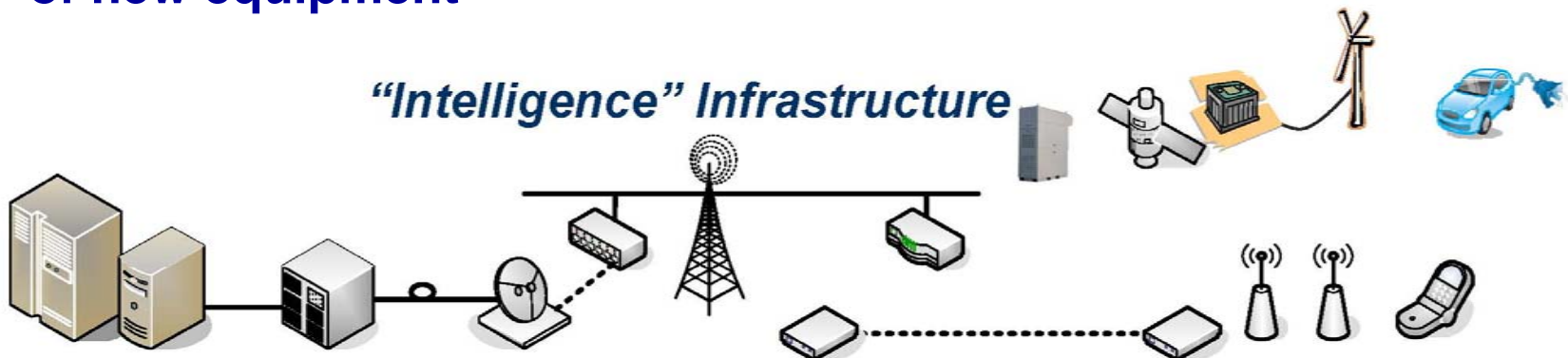# Smart Grid = Electrical + Intelligence Infrastructures
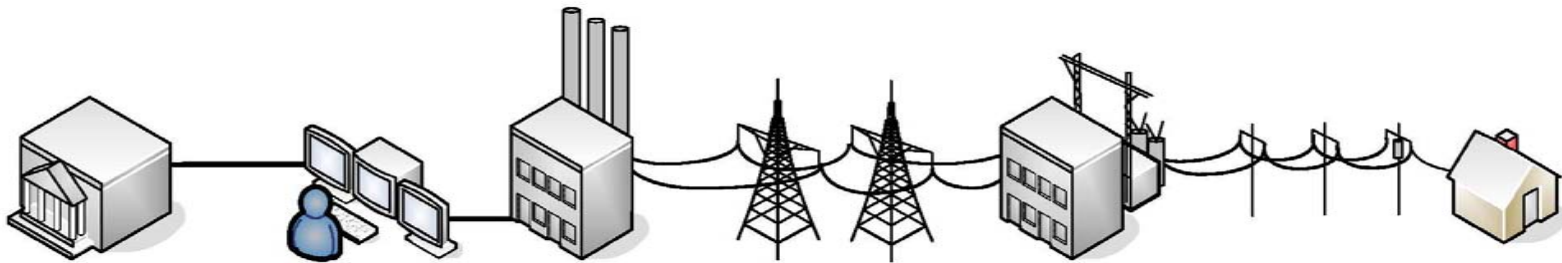
Electrical Infrastructure

Combining electrical and communication grids requires <u>interoperability</u> of new equipment

<u>Interoperability</u> requires reliable standards and validated performance

"Intelligence" Infrastructure

Graphics courtesy of EPRI

Government Roles in Smart Grid

Federal

U.S. DEPARTMENT OF ENERGY

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

Federal Energy Regulatory Commission

Public Utility Commissions
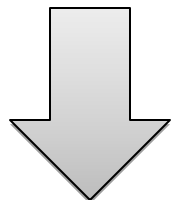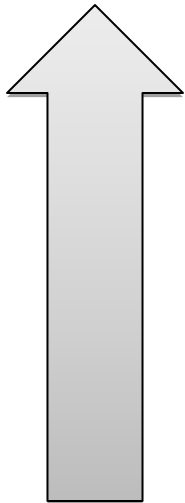
State

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**…"

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**…"

… 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
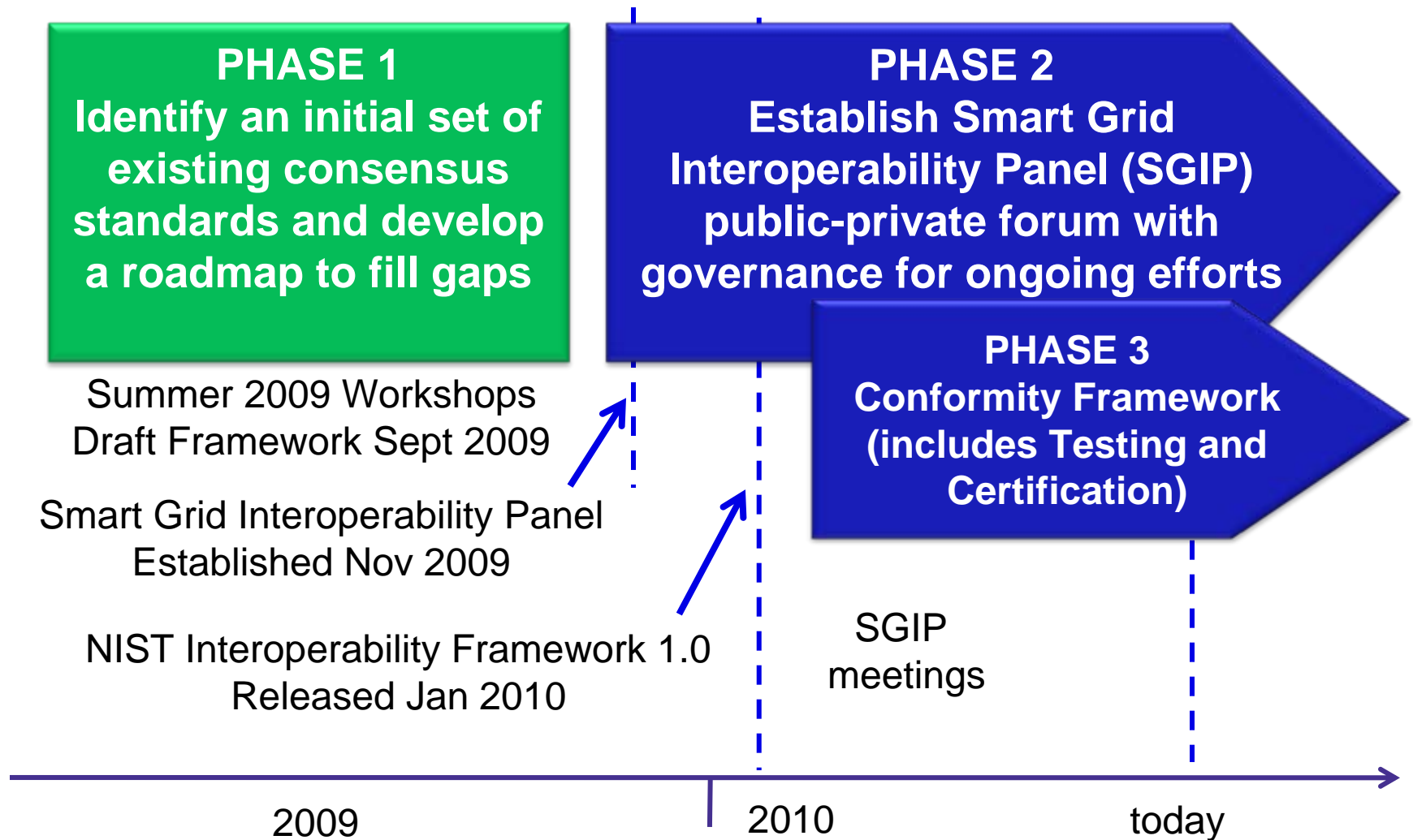
PHASE 1
Identify an initial set of existing consensus standards and develop a roadmap to fill gaps

PHASE 2
Establish Smart Grid Interoperability Panel (SGIP) public-private forum with governance for ongoing efforts

PHASE 3
Conformity Framework (includes Testing and Certification)

Summer 2009 Workshops
Draft Framework Sept 2009

Smart Grid Interoperability Panel Established Nov 2009

NIST Interoperability Framework 1.0 Released Jan 2010

SGIP meetings

2009   2010   today

George Arnold, NIST - National Coordinator for Smart Grid Interoperability

NIST Smart Grid Timeline

Year/Month	
2007	← Dec 2007 – Energy Independence and Security Act
2008	← Aug 2008 – NIST forms Domain Expert Working Groups
	← Nov 2008 – NIST Workshop at GridInterop 2008 in Atlanta
2009	
January	
February	← Feb 17 – American Reinvestment and Recovery Act
March	← Mar 19 – FERC Smart Grid Policy Statement and Action Plan
	← George Arnold: National Coordinator for SG Interoperability
April	
May	
June	NIST Smart Grid Interoperability Roadmap Workshops and Development
July	
August	Priority Action Plans & SGIP Charter Development (to Nov 12)
September	← NIST Smart Grid Interoperability Framework 1.0 Draft
October	SGIP Update Webinars – Oct 9, Oct 28, Nov 12
November	← SGIP Inaugural Meeting November 16-19
December	← Governing Board First Meeting Dec 8-9
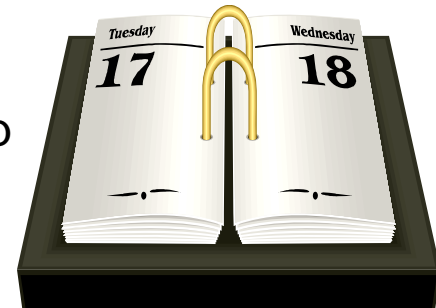
- SGIP Officers Elected
- Architecture Committee, Testing and Certification Committee, Cyber Established

NIST Smart Grid Timeline (Continued)

2010	
January	← NIST Smart Grid Federal Advisory Committee Notice ← NIST Smart Grid Interoperability Framework Release 1.0 ← SGIP Governing Board Jan 28
February	← SGIP Webinar Feb 8
March	← SGIP Meeting and SGIP Governing Board (GB) Meeting
April	March 16-17, Chantilly, VA
May	← SGIP Meeting and SGIP GB Meeting
June	May 24 - 27/ Connectivity Week
July	← SGIP Webinar Jul 23
August	
September	← SGIP Meeting and SGIP GB Meeting September 14-16, St. Louis, MO
October	← SGIP Webinar Oct 29
November	← SGIP Meeting and SGIP GB Meeting
December	Nov 30 – Dec 3 / GridInterop

NIST Framework and Roadmap, Release 1.0

Revised version Jan 19, 2010

Smart Grid Vision / Model

75 key standards identified

- IEC, IEEE, …

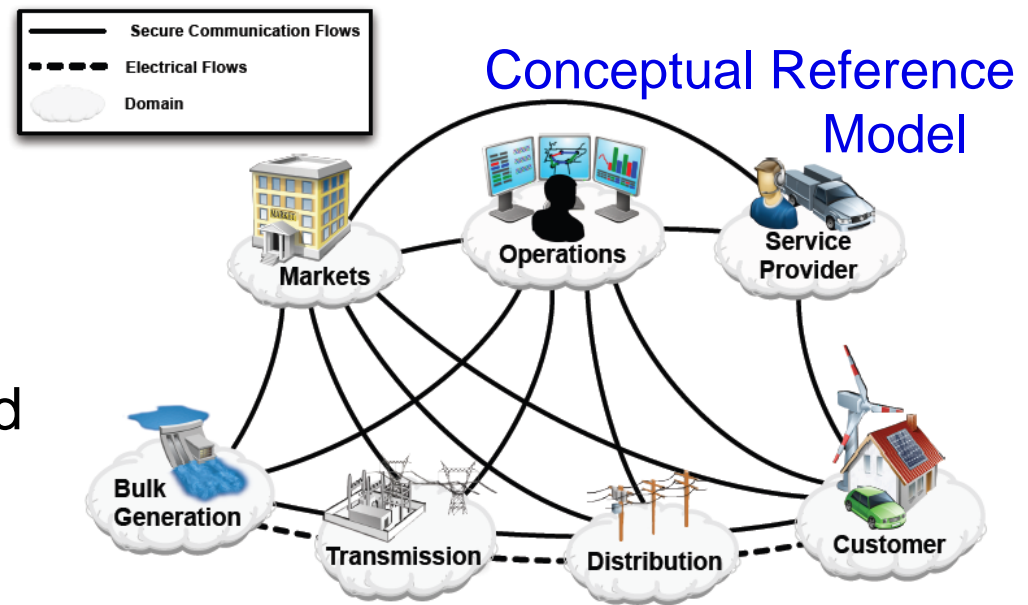16 Priority Action Plans to fill gaps (one completed)

Cyber security strategy

- Companion document NISTIR 7628

Next steps – keep standards acceleration going strong!

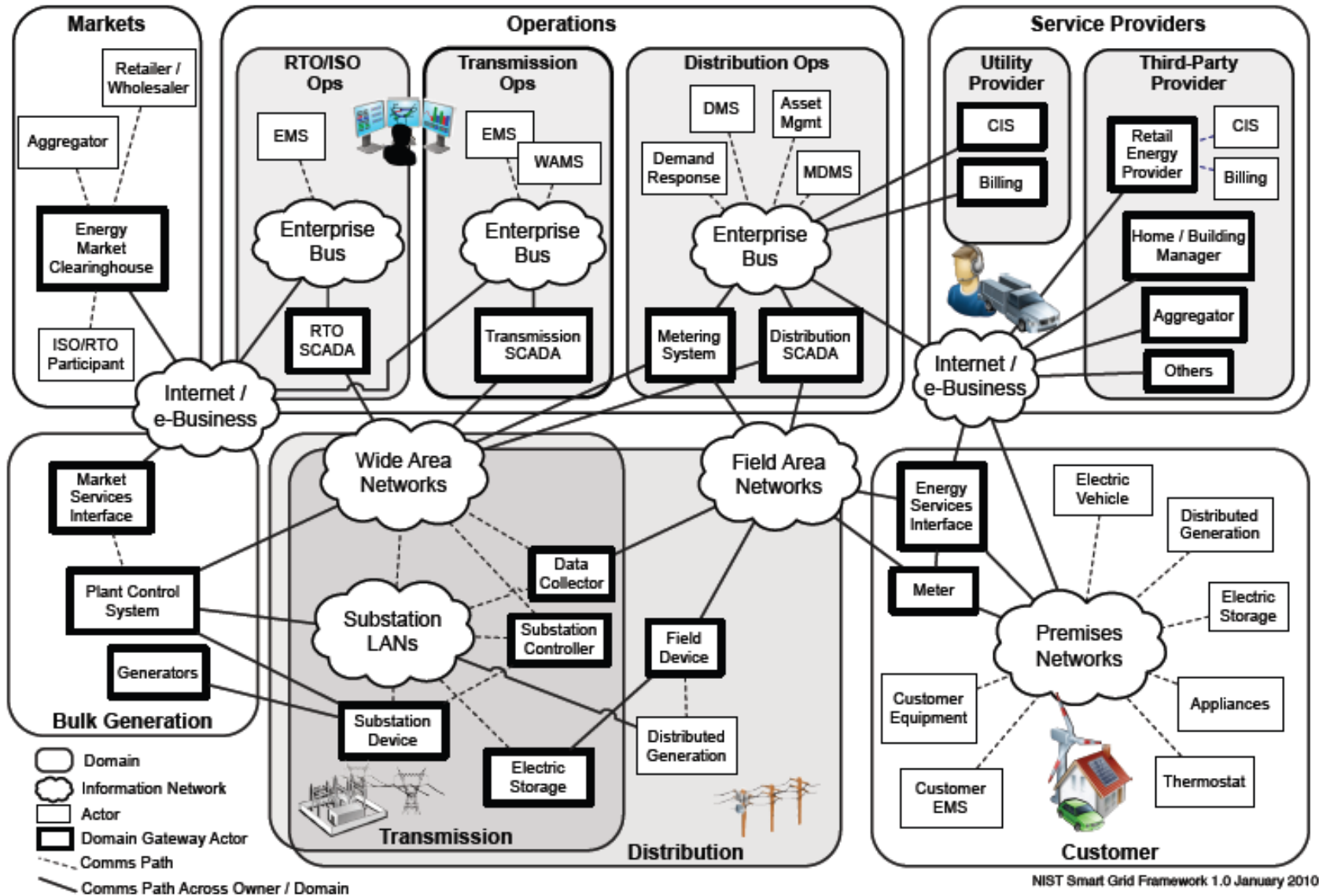Public comments reviewed and addressed

NIST Special Publication 1108

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

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

Secure Communication Flows
Electrical Flows
Domain

Conceptual Reference Model

Markets Operations Service Provider

Bulk Generation Transmission Distribution Customer

NIST Smart Grid Framework 1.0 January 2010

NLST
National Institute of Standards and Technology

NIST Smart Grid Conceptual Model


NIST Smart Grid Framework 1.0 January 2010

13

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

Source of Standards in NIST Roadmap

US Government 10%

US domiciled (Domestic) SDO 13%

International 77%
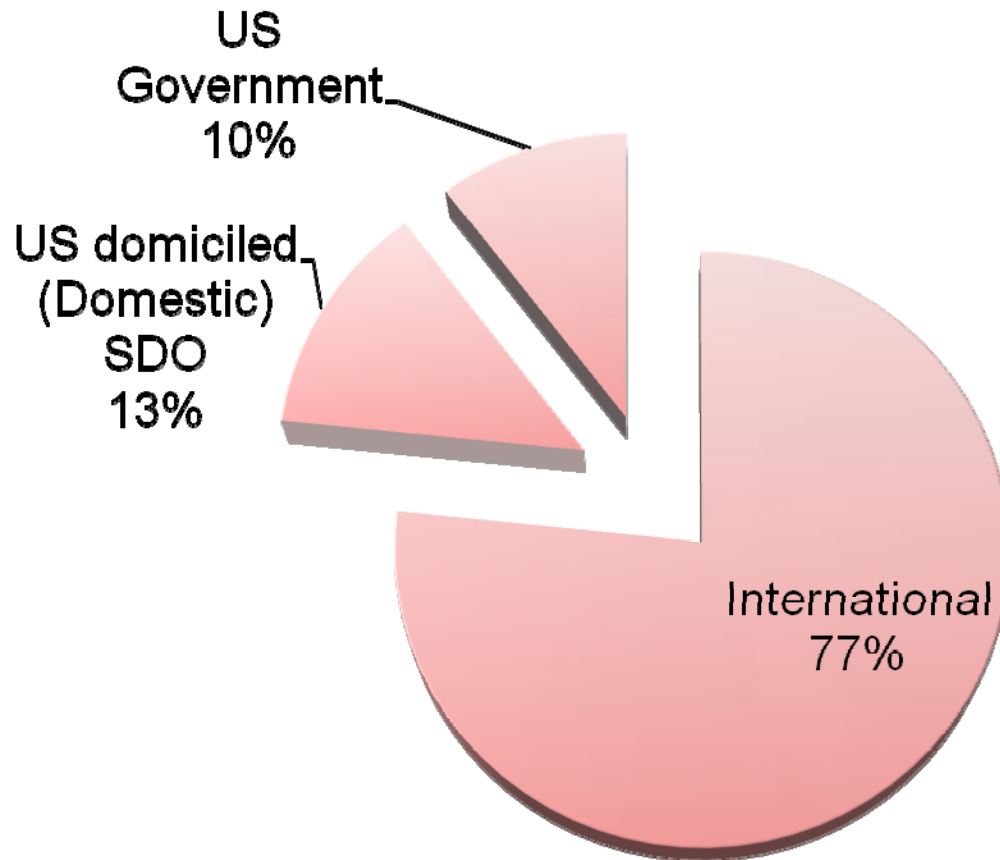
- IEC/ISO/ITU
- IETF
- IEEE/SAE/ISA
- Global consortia

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 2009 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)
Facility Smart Grid Information Standard (PAP17)
Energy storage interconnection guidelines (PAP 07)
Interoperability standards to support plug-in electric vehicles (PAP 11)
Wind Interconnection Standards (PAP 16)

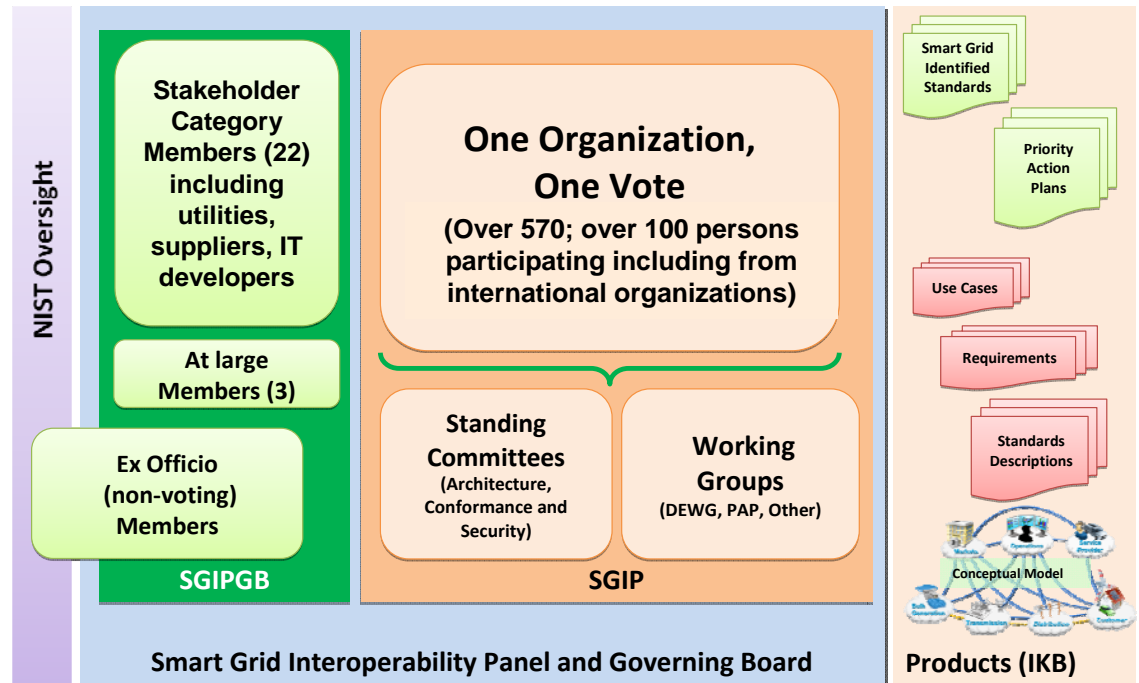| Priority Action Plans |
| --- |
| Guidelines for use of IP protocol suite in the Smart Grid (PAP 01) |
| Guidelines for the use of wireless communications (PAP 02) |
| Harmonize power line carrier standards for appliance communications in home (PAP15) |
| Develop common information model (CIM) for 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) |

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

SGiP

NIST Oversight

Stakeholder Category Members (22) including utilities, suppliers, IT developers

At large Members (3)

Ex Officio (non-voting) Members

SGIPGB

One Organization, One Vote
(Over 570; over 100 persons participating including from international organizations)

Standing Committees (Architecture, Conformance and Security)

Working Groups (DEWG, PAP, Other)

SGIP

Smart Grid Interoperability Panel and Governing Board

Smart Grid Identified Standards

Priority Action Plans

Use Cases

Requirements

Standards Descriptions

Conceptual Model

Products (IKB)

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

Example of SGIP relationships to CIM
PAP10: Customer Energy Usage Information
and PAP17: Facility Energy Information Model

Objective: Provide a seed information model for energy usage to facilitate collaborative energy management

PAP related activities:

▪SEP2.0 and OpenADE **used** CIM elements in models supporting their customer energy communications and **extended** some CIM elements in the process

▪The PAP and EIS Alliance developed use cases and requirements for EUI

▪NAESB standards effort created to define the seed model using SEP 2.0, OpenADE, CIM and requirements as input, and providing **feedback** to CIM.
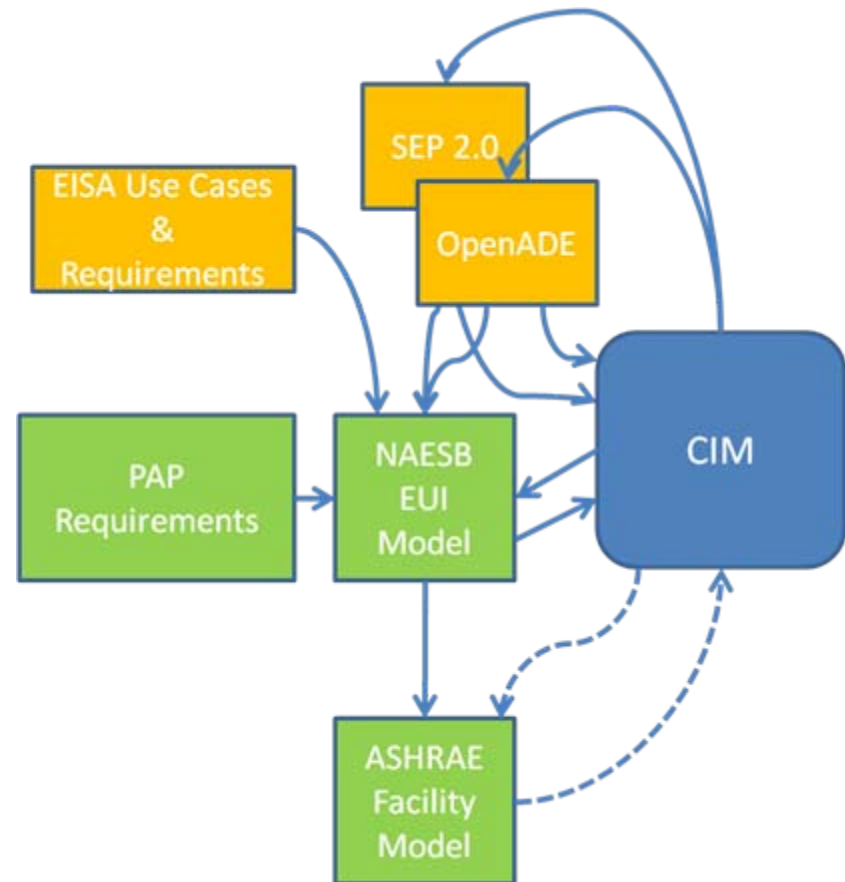
Example of SGIP relationships to CIM
PAP8: CIM/61850 for Distribution Grid Management and PAP14: Transmission and Distribution Power Systems Model Mapping

Key Objectives:

PAP8: Develop strategies to integrate and expand IEC 61970-301, IEC 61968, Multispeak and IEC 61850 for Smart Grid applications

PAP14: Develop strategies to expand and integrate MultiSpeak, IEC 61850, IEC 61968, IEC 61970, IEEE PC37.237 (Time Tagging), IEEE PC37.239 (COMFEDE) and the future IEEE Common Settings file format for Smart Grid Applications

Outputs related to CIM:

- Use cases and sequence diagrams for new messages to support Smart Grid capabilities (to be used to extend CIM and 61850)

- MultiSpeak UML model

- MultiSpeak–CIM model mapping (in process)

- CIMTool revision for profiling MultiSpeak (in process)

CIM community response to Smart Grid efforts

What would be ideal:

- Provide a clear and consistent message about – what CIM is, how it should be used, and how it might change.
- Provide active guidance to selected SGIP sponsored activities that are building on CIM (as was done in PAP10 NAESB EUI effort).
- Be open to suggested enhancements, clarifications, mappings and even corrections coming from smart grid efforts.

What this might mean:

- More feedback and changes to CIM than in the past.
- More resources will be needed in TC57 to coordinate with SG efforts and address requested changes to the model.
- More openness about planned enhancements.

Some coming related events

- Post narrative summaries of identified Smart Grid standards (late summer 2010)

- SGIP Plenary and Governing Board Meetings (Sept 14 – 16) – Semantic Summit

- NAESB Customer Energy Usage Information Model standardized (Dec 2010)

- ASHRAE Facility SG Energy Information Model draft public review (February 2011)

- NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 2.0 (2011)

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

Jerry FitzPatrick, fitzpa@nist.gov

George Arnold, National Coordinator for Smart Grid Interoperability, george.arnold@nist.gov