NIST Smart Grid Program

Working with industry to coordinate development of interoperability standards

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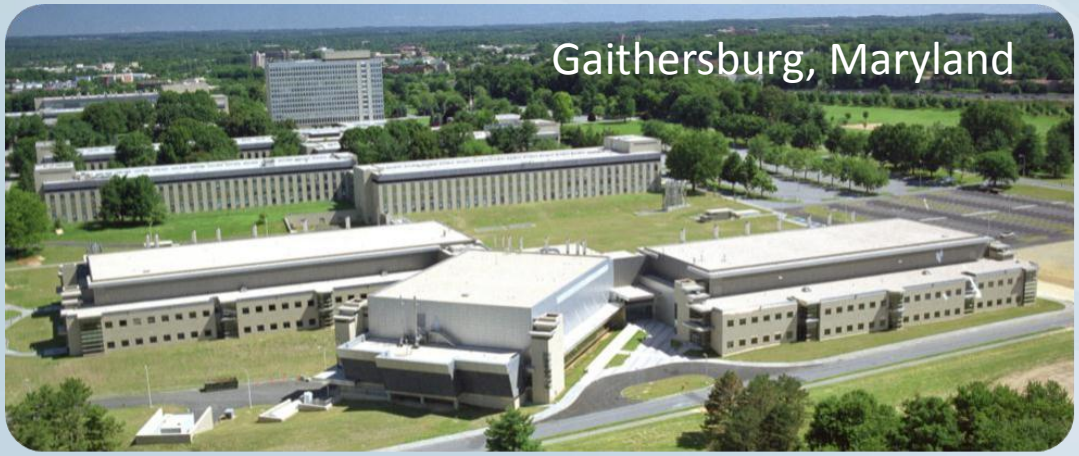
NIST National Institute of Standards and Technology U.S. Department of Commerce

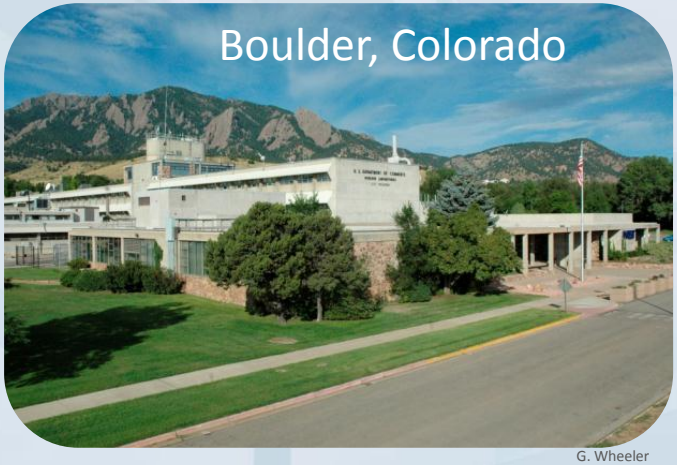
engineering laboratory

National Institute of Standards and Technology

- Non-regulatory agency in the U.S. Department of Commerce
  - Measurement science research (3 Nobel Prize winning scientists)
  - Lead role in coordinating U.S. government standards activities



Courtesy HDR Architecture, Inc./Steve Hall © Hedrich Blessing



G. Wheeler

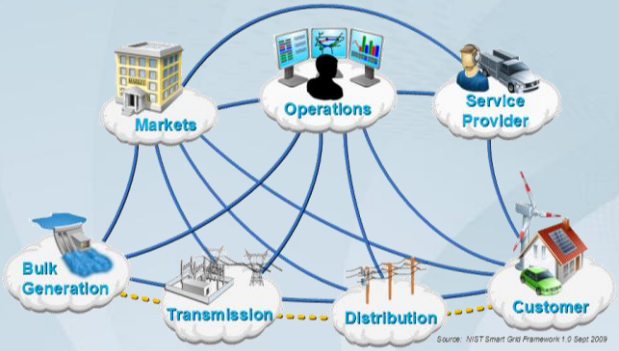
- U.S. National Metrology Institute (strong connections and collaborations with international metrology community)
- Strong partnerships with industry, academia, government
- Research, calibrations, standard reference materials, …
- Engineering, IT, Physical Measurement, Material Measurement Labs

Paradigm Shift
Prioritization
Policies
Partnerships
People
Plan
Processes

→ **P**roduce Results

www.nist.gov/smartgrid/

Paradigm Shift → Smart Grid



From:

- Vertically integrated monopolies
- Centralized generation
- Limited awareness
- Hierarchical network
- Deterministic control
- Generation to meet demand
- Proprietary architectures and interfaces

To:

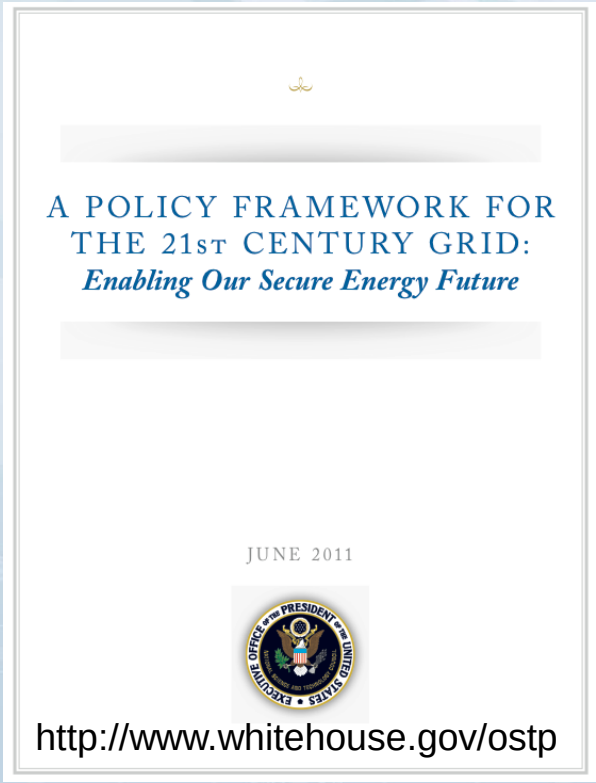
- Restructured competitive markets
- More distributed generation
- Sensors everywhere
- Interconnected microgrids
- Stochastic control
- Responsive demand and generation
- Open standards

Prioritization - Smart Grid is National Priority

"We'll fund a better, smarter electricity grid and train workers to build it…"
President Barack Obama

- "It is the policy of the United States to support the modernization of the Nation's electricity [system]… to achieve…a Smart Grid."

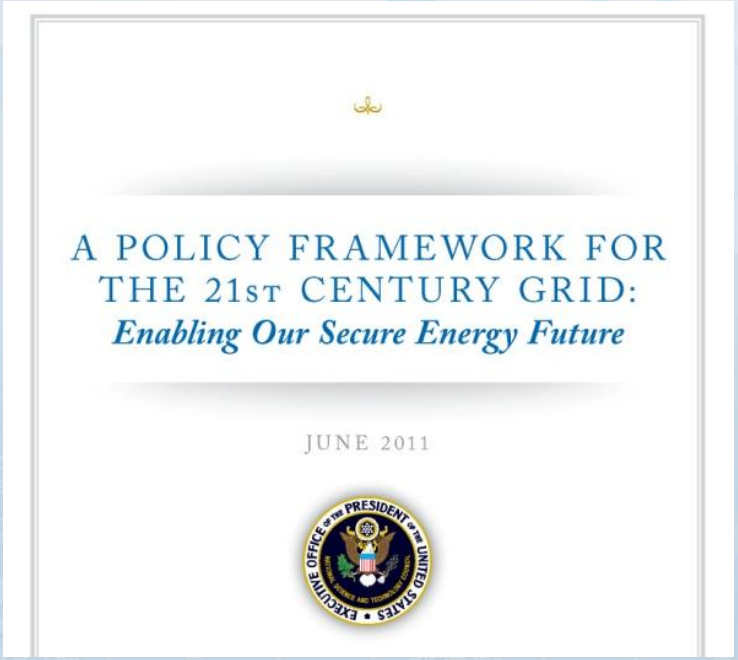
- *U.S. Congress, Energy Independence and Security Act of 2007*



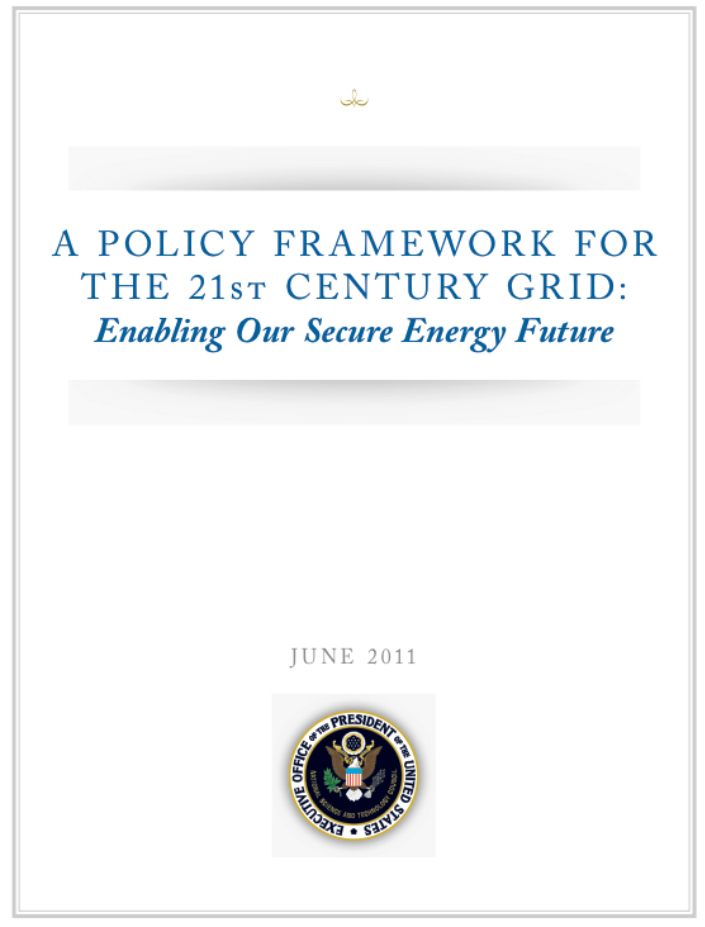
Policies – Includes Key Role for Standards

White House June 2011 Policy Framework includes 4 key Federal policy recommendations:
enable cost-effective smart grid investments, unlock innovation, empower and inform consumers, and secure the grid

The Energy Independence and Security Act of 2007 gives NIST *"primary responsibility to coordinate development of a framework that includes …* ***standards*** *… to achieve interoperability of smart grid devices and systems…"*



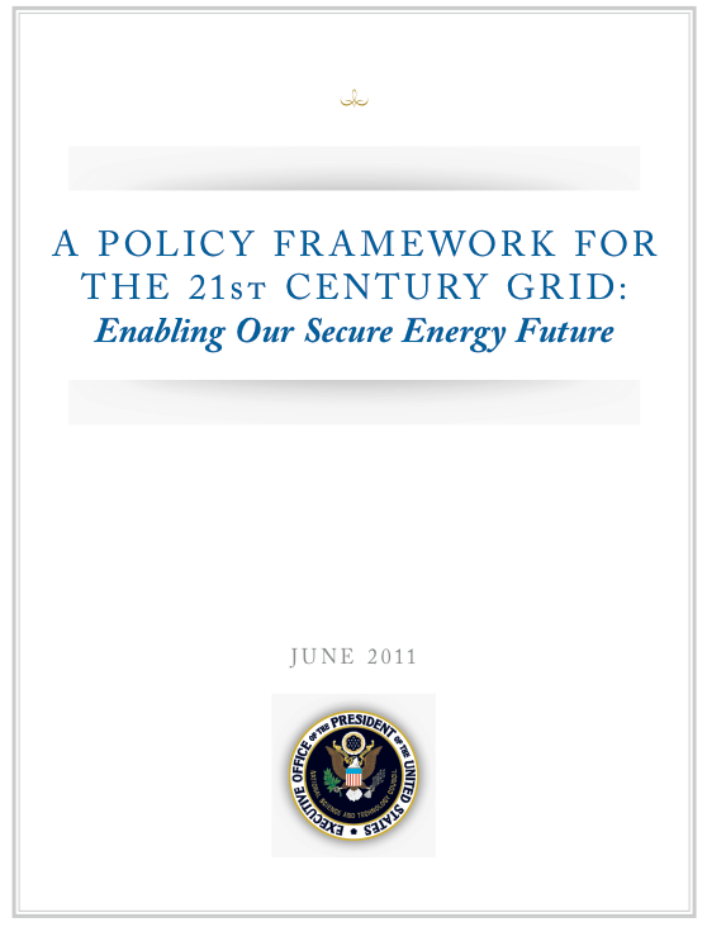
Policies – Includes Key Role for Standards



- U.S. Federal government will continue to catalyze development and adoption of open standards
  - Standards help ensure that today's investments will be valuable in the future
  - Standards help catalyze innovation
  - Standards support consumer choice
  - Standards help lower prices
  - Standards highlight best practices as utilities face difficult choices
  - Standards help open markets

http://www.whitehouse.gov/ostp

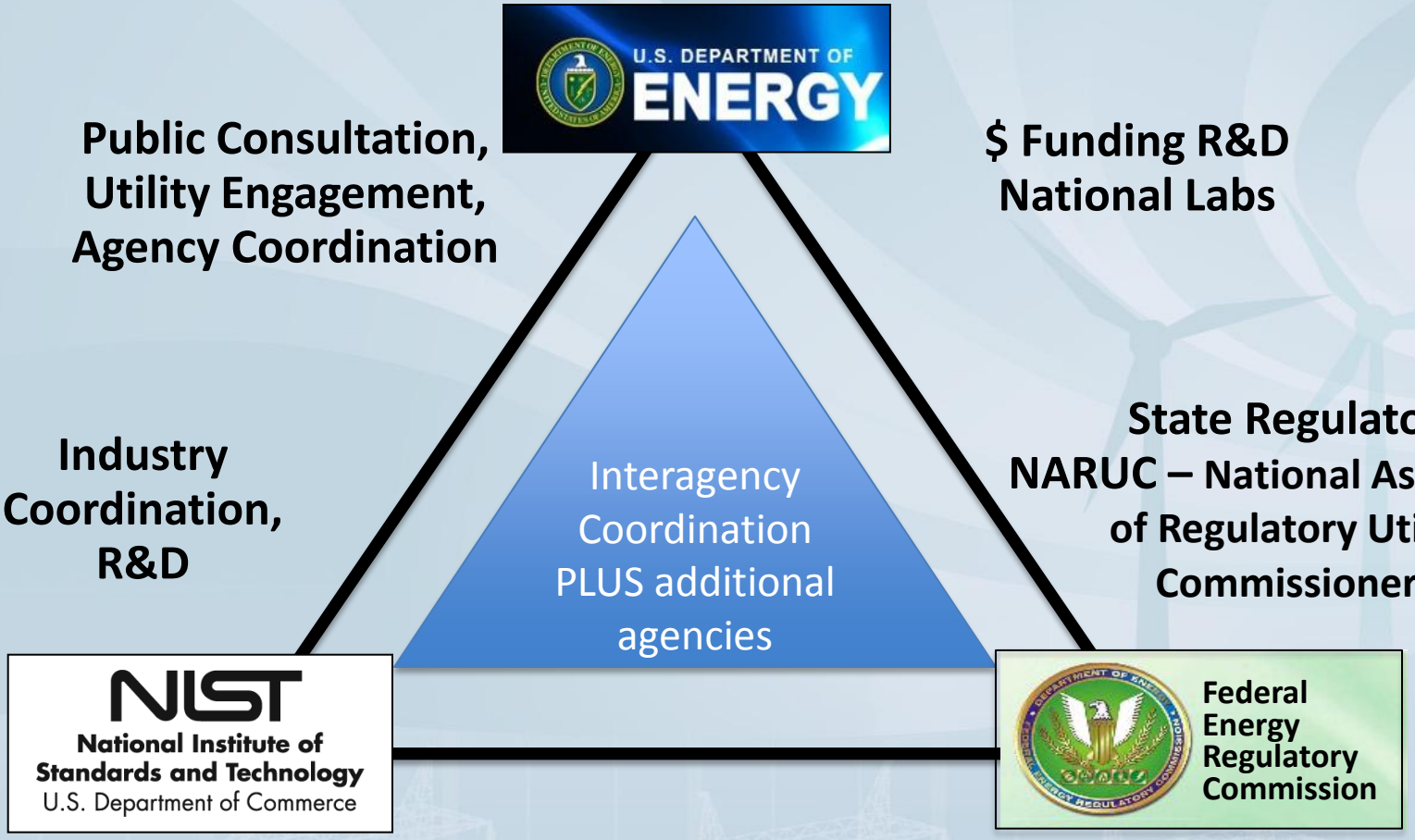
Policies – Includes Key Role for Standards



http://www.whitehouse.gov/ostp

- Regulators should publicly embrace interoperability standards and take appropriate action regarding development and implementation
- **FERC Order RM 11-2-000 (2011)** encouraged utilities, smart grid product manufacturers, regulators, and other smart grid stakeholders to actively participate in the NIST interoperability framework process to work on the development of interoperability standards and to refer to that process for guidance on smart grid standards

Partnerships – U.S. Gov't Roles in Smart Grid



Partnerships – Standards Development

International

Global Consortia

Regional and National

IEC

ISO

ITU

IETF

IEEE

SAE International

ZigBee Alliance

OGC
Open Geospatial Consortium, Inc.

and more …

OASIS

and more …

ANSI
American National Standards Institute

SHARE

NAESB

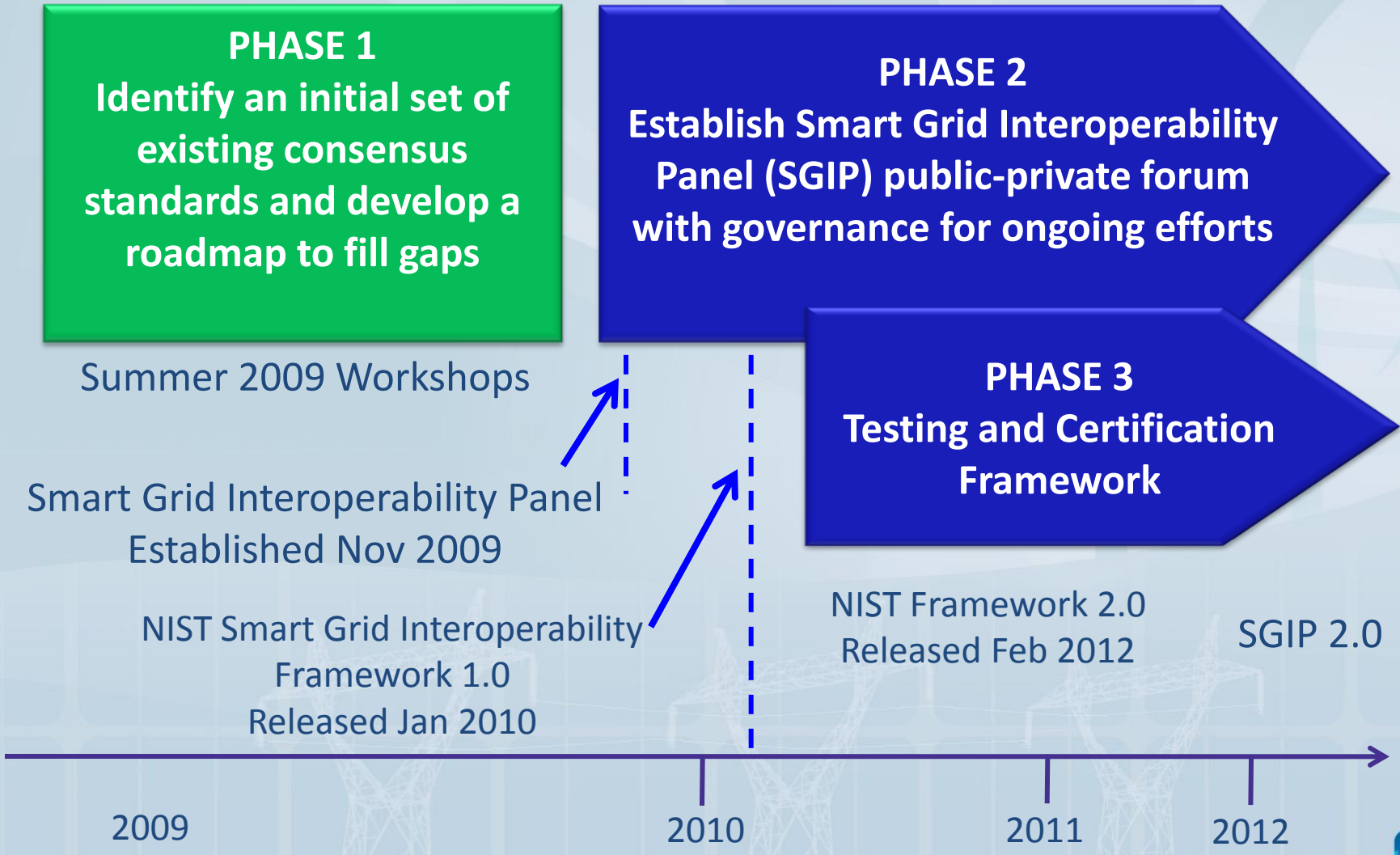
NEMA

People – White House Kickoff Meeting

- May 18, 2009: Meeting chaired by Secretaries of Energy and Commerce
- 66 CEOs and senior executives, federal and state regulators

- Commitment of industry CEOs for their people (staff) to participate in NIST process to accelerate development of a smart grid roadmap

Plan: NIST Three Phase Plan to work with industry to accelerate standards



Public Process – multiple stakeholders input

- Three public workshops in 2009
- More than 1500 participants
- Hundreds of companies, organizations, agencies
- Online collaboration wiki
- Public Federal Register Notices
- Web conferences
- All information publicly available on-line

www.nist.gov/smartgrid/

Produced Results: NIST Smart Grid Framework

- Published January 2010, Release 2.0 February 2012
  - Extensive public input and review
- Smart Grid Vision & Reference Model
- Identifies 100 standards
- Priority Action Plan projects to fill key gaps
- Testing & certification framework
- Companion cyber security strategy
- Smart Grid Interoperability Panel

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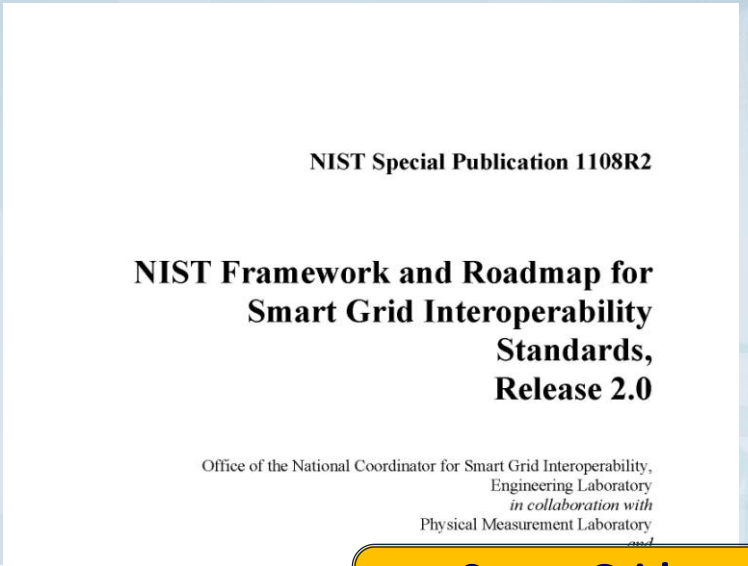
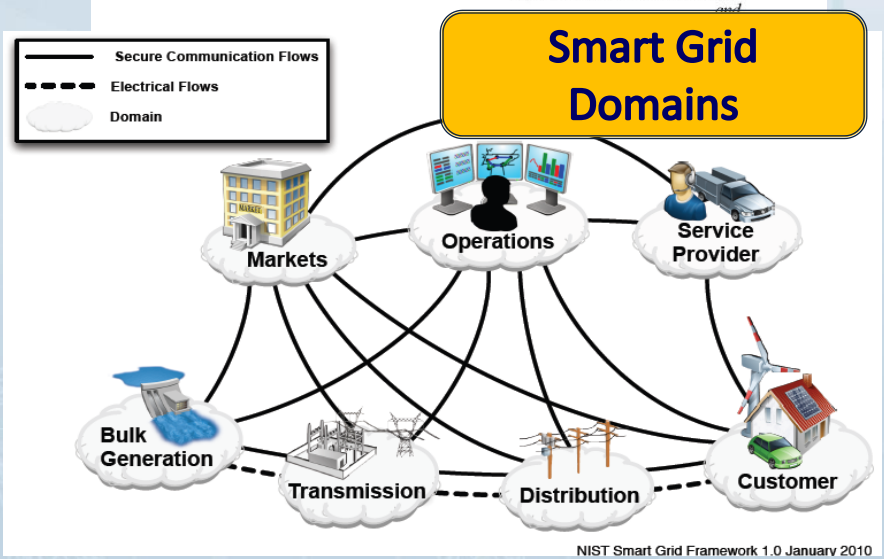
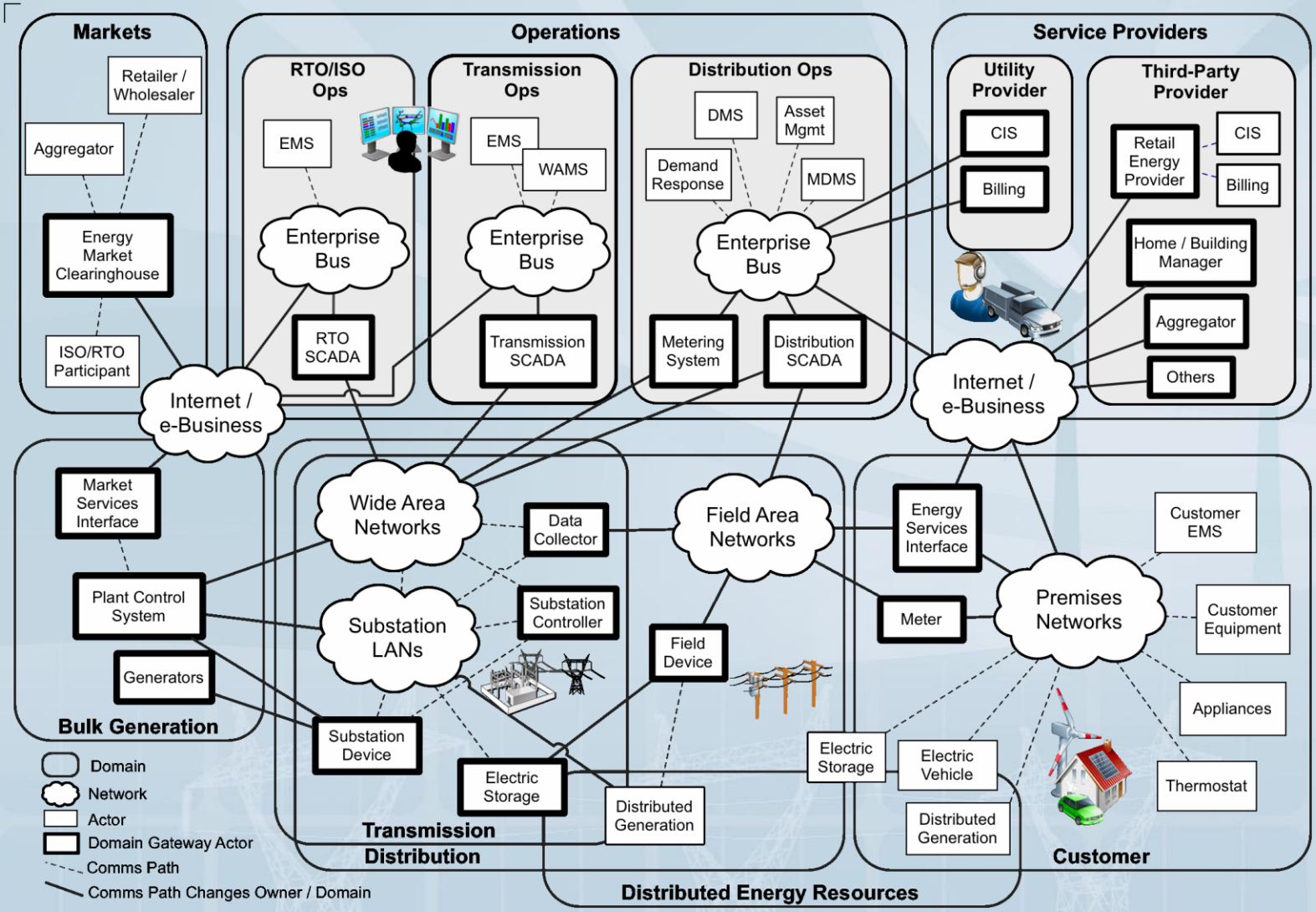

NIST Special Publication 1108R2

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

Office of the National Coordinator for Smart Grid Interoperability,
Engineering Laboratory
in collaboration with
Physical Measurement Laboratory



NIST Smart Grid Reference Model (Release 2.0)



NIST Smart Grid Interoperability Panel

- Public-private partnership created in Nov. 2009
- Approx. 750 member organizations, 1900+ 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, …
  - Significant international participation
- Web-based participation

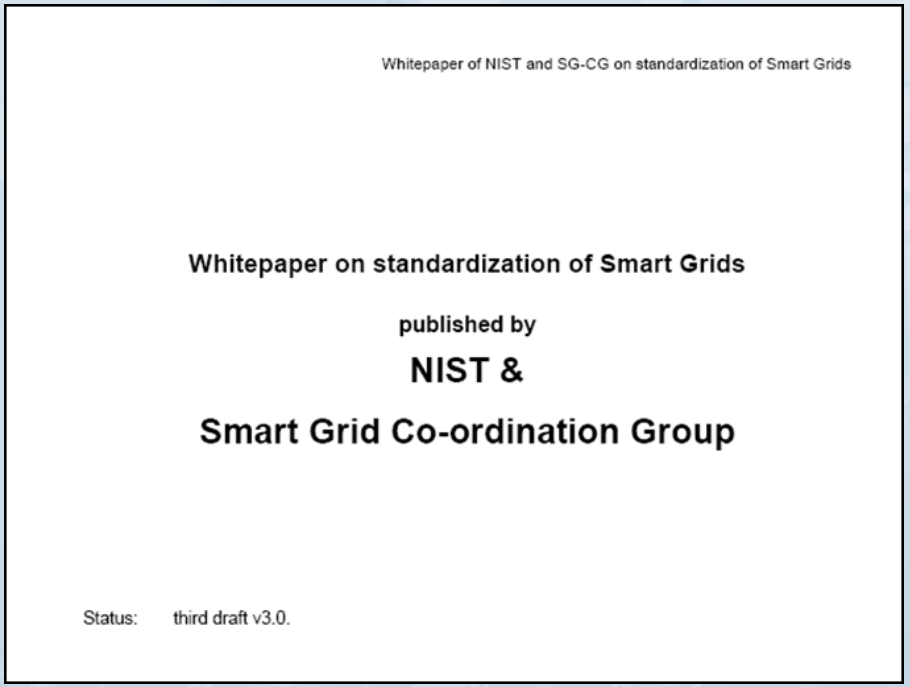
SGIP Twiki:
http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIP

Partnerships – International

- International standardization outreach – NIST
  - IEC SG3 Strategic Group on Smart Grid
  - USNC (US National Committee) activities
  - IEEE, other liaisons
  - APEC, ISGAN, various international fora …
  - Many bilateral interactions …
- Smart Grid Interoperability Panel
  - International Task Force
  - International Meeting (Montreal, Canada, July 2011)
  - Letters of Intent (including Japan, Korea, EU, Ecuador, Columbia in preparation…)
  - International membership examples: State Grid of China, Korea Smart Grid Association, Inmetro (Brazil), BC Hydro (Canada), Comision Federal de Electricidad (Mexico), Nippon Telegraph and Telephone Corporation (Japan) and many other multinational companies, ….

Partnerships: Coordination with Smart Grid – Coordination Group and European Standards Bodies CEN, CENELAC, ETSI

- Regular Meetings of SC-CG, NIST and SGIP (latest June 2012)
- NIST/ SG-CG Joint White Paper
  - Published at Grid Week 2011 in Washington DC
- Common Goals:
  - Strive for global solutions – where appropriate within the constraints of our policy objectives
  - Don't reinvent the wheel
  - Flexible standards framework
  - Common conceptual model
  - System level top down approach
  - Organization and processes for standardization
  - Synchronization of work

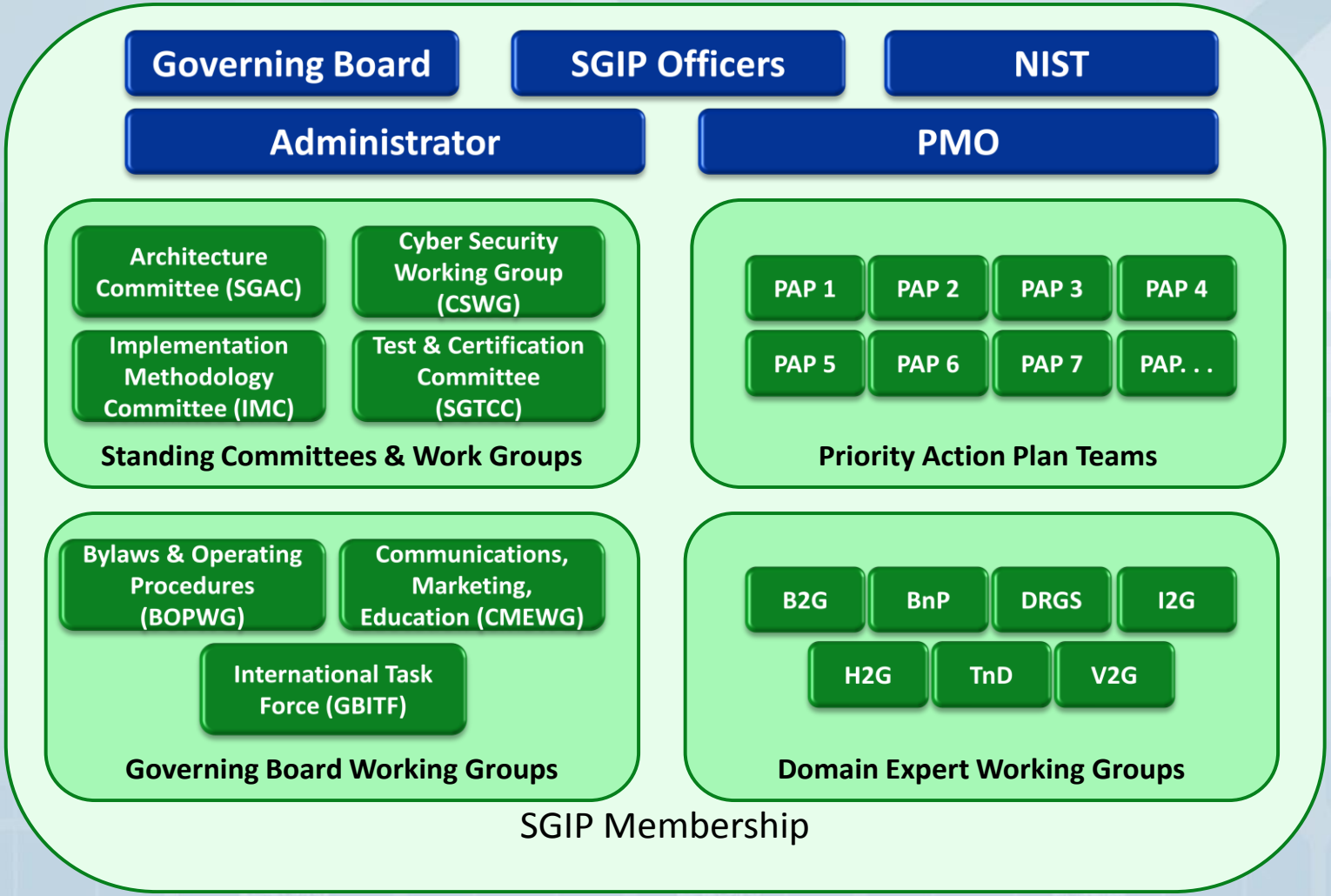


- Areas of Collaboration:
  - Key messages, architecture, standards priorities, testing/certification, information exchange

Partnerships: APEC Workshop-Regulatory Approaches to Smart Grid Investment and Deployment

- NIST-organized workshop held May 16-17, 2012 in Quebec City, Quebec, Canada after the international 5th World Forum on Energy Regulation
- Goals: Share information and increase APEC regulators' understanding of how interoperability supports regulatory goals; offer private sector perspectives; and strengthen coordination and communication among regulators in the APEC region
- Outcomes:
  - Efficient development of standards and interoperability will reap key benefits for electricity regulators
  - There is a need for more robust engagements between the standards community and regulators
  - The standards community could benefit from an analysis of the needs of regulators to understand the standards process and its implications for the modernization of electric grids and the trade in smart grid technologies.
  - There is a need for the development and communication of best practices for regulators in providing input to the standards community.
  - Continued education and outreach on standards interoperability issues will be beneficial and we should identify organizations and forums for this task.

Process: Smart Grid Interoperability Panel



Produced Results: SGIP Catalog of Standards

Criteria for inclusion

- Formalized SGIP process for evaluation and decision to include
- Requires reviews by architecture, cybersecurity, and domain expert committees
- Criteria
  - Relevant to advancing interoperability of Smart Grid devices and systems
  - Accepted by the community
  - Suitable for deployment
  - Focuses on interfaces to facilitate integration and promote implementation flexibility
  - Documented and maintained by multi-member organization

Information included in catalog for each standard

- Development organization and process
- Support, conformance, certification, and testing
- Application domains targeted by the standard
- Interoperability categories covered by the standard (organizational, informational, technical layers)
- Cybersecurity and privacy aspects
- Recommendations resulting from reviews

Produced Results: Green Button Initiative

- *Common-sense idea that electricity customers should be able to download their own energy usage information in a consumer- and computer-friendly electronic format from their utility's secure website.*

- *Result of collaboration among White House, DOE, NIST, state regulators, utilities, vendors, SGIP, and North American Energy Standards Board*

13 million US consumers have access to Green Button data NOW, and 31+ million will by 2013

Green Button Download My Data

www.greenbuttondata.org & www.nist.gov/smartgrid/greenbutton.cfm

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