

# NIST Smart Grid Standards Process

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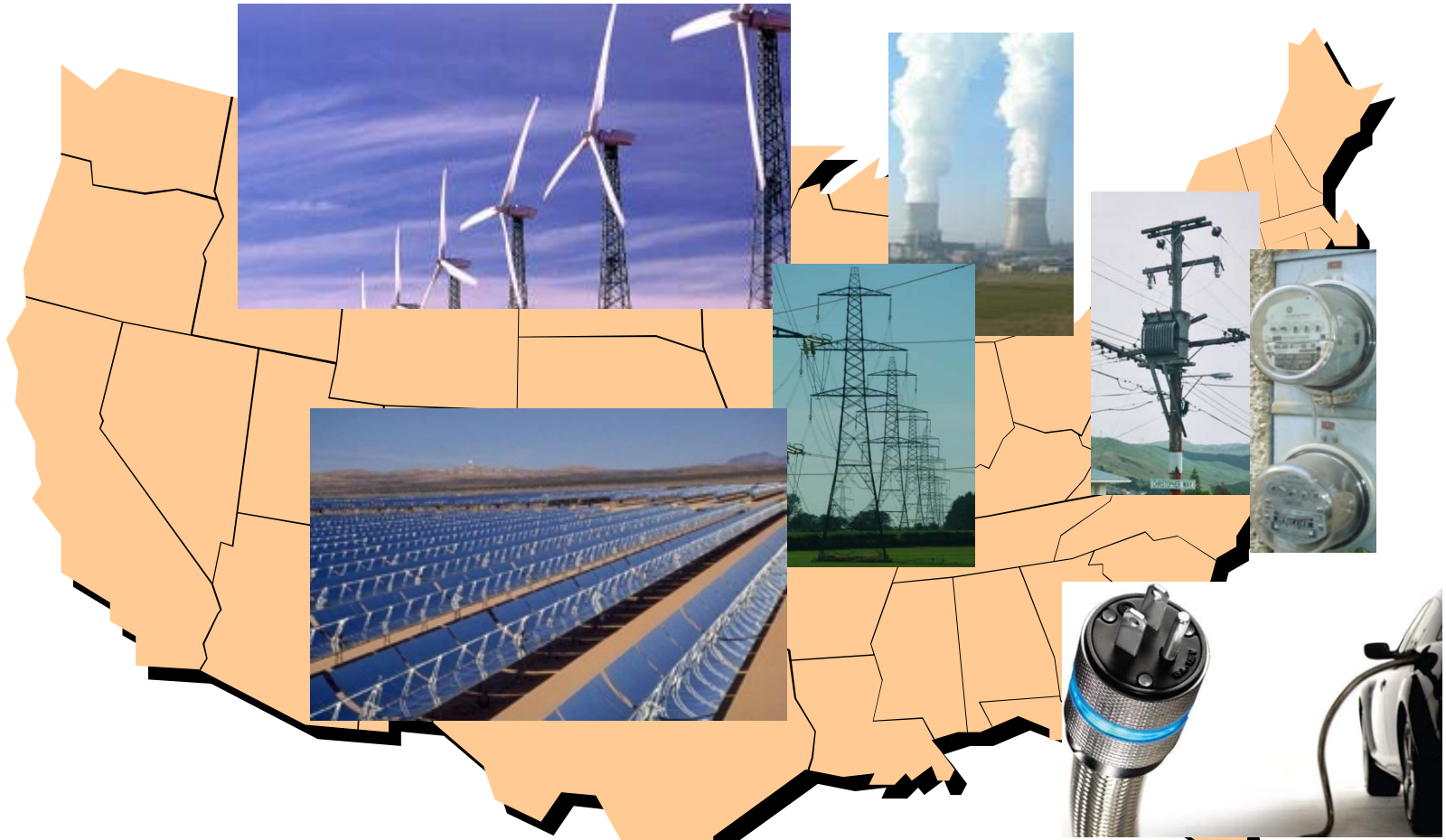
# National Coordinator for Smart Grid Interoperability

## George Arnold



# Standards Are Essential

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*To Realizing a National Interoperable and Secure Smart Grid*

*Energy Independence and Security Act (EISA) of 2007*

*Title XIII, Section 1305.*

*Smart Grid Interoperability Framework*

- In cooperation with the DoE, NEMA, IEEE, GWAC, and other 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...**”

# The Need for Standards is Urgent

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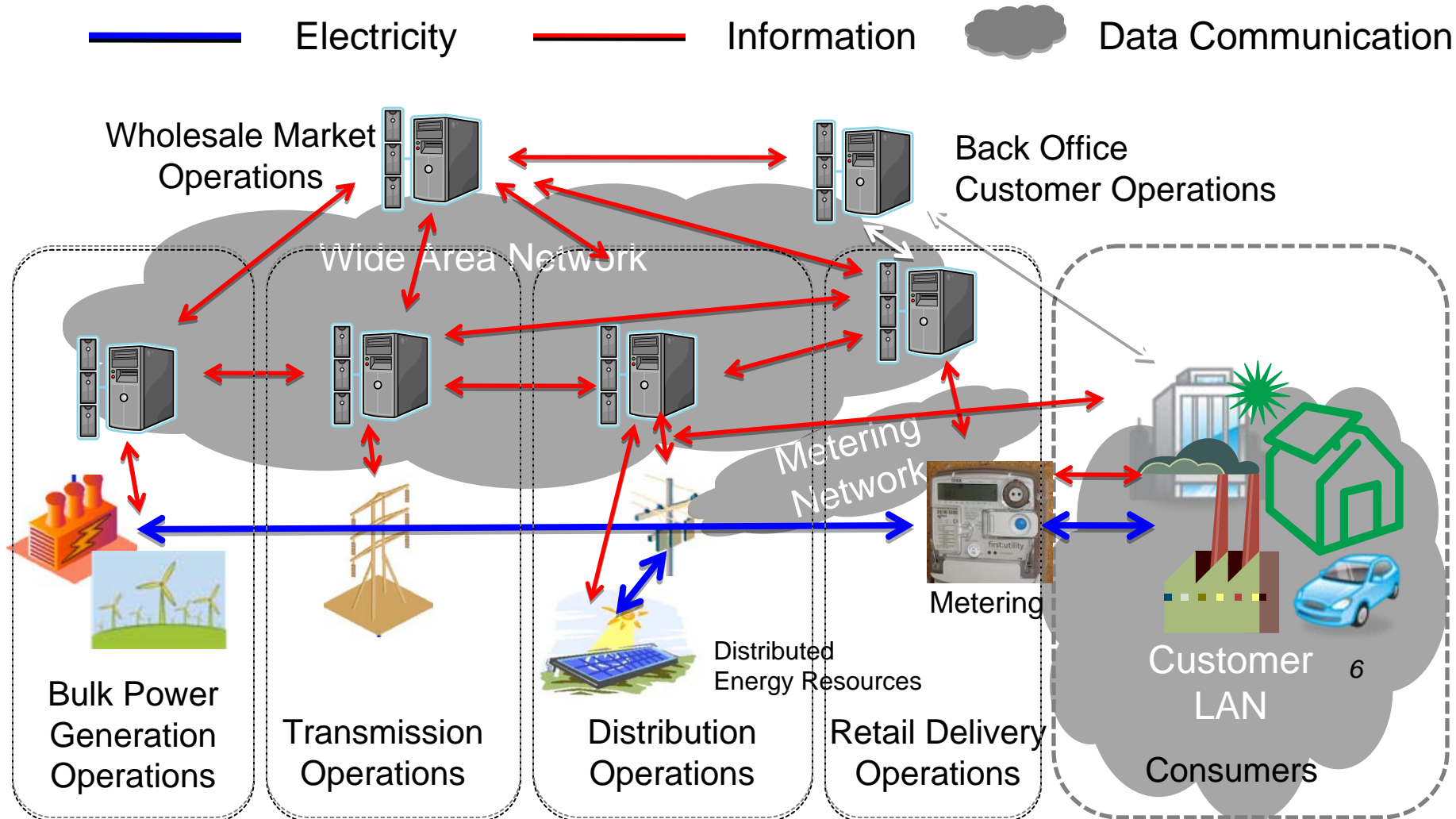
## Example: Smart Meters

- \$40 - \$50 billion dollar deployment nationwide
- Underway now
- ARRA will accelerate
- Rapid technology evolution
- Absence of firm standards

Source: Congressional Research Service Report

# What Interoperability Standards are Needed?

Standards are needed for each of the interfaces shown to support many different smart grid applications. Standards are also needed for data networking and cybersecurity



# *We Need A Standards Roadmap*

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- Capabilities
- Priorities
- Architecture
- Standards
- Release Plan
- Responsibilities
- Governance
- Testing and Certification



## *NIST Plan was developed after listening to key industry concerns*

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- Open, participative process – 80% of electric grid is owned and operated by private sector
- Utilities recognize need for speed, but want a systematic, not ad hoc process
- Standards should be developed by private sector standards bodies, with NIST coordination
- Standards are necessary but not sufficient – testing and certification regime is essential



# NIST Three Phase Plan

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## PHASE 1

Recognize a set of initial existing consensus standards and develop a roadmap to fill gaps

## PHASE 2

Establish public/private Standards Panel to provide ongoing recommendations for new/revised standards to be recognized by NIST

PHASE 3  
Testing and Certification Framework

2009

2010

March

September

## **April 28-29 Workshop**

- Discussed Architecture and Requirements
- Evaluated existing standards
- Reached consensus on Low Hanging Fruit (SG Release 1)
- Identified issues

## **May 19-20 Workshop**

- Focus on Roadmap
- Identify additional standards needed
- Priorities
- Responsibilities
- Timeline

## *What Goes in Release 1.0?*

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- Existing or emerging standards usable now
- Have broad stakeholder consensus
- Building blocks for identified areas of applicability
  
- Initial list of standards identified at the April workshop
- List may be expanded at May workshop

## NIST- Recognized Standards Release 1.0

Following the April 28-29 Smart Grid Interoperability workshop, NIST deemed that sufficient consensus has been achieved on 16 initial standards

On May 8, NIST announced intention to recognize these standards following 30 day comment period

NIST's announcement recognized that some of these standards will require further development and many additional standards will be needed.

NIST will recognize additional standards as consensus is achieved

Standard	Application
AMI-SEC System Security Requirements	Advanced metering infrastructure (AMI) and Smart Grid end-to-end security
ANSI C12.19/MC1219	Revenue metering information model
BACnet ANSI ASHRAE 135-2008/ISO 16484-5	Building automation
DNP3	Substation and feeder device automation
IEC 60870-6 / TASE.2	Inter-control center communications
IEC 61850	Substation automation and protection
IEC 61968/61970	Application level energy management system interfaces
IEC 62351 Parts 1-8	Information security for power system control operations
IEEE C37.118	Phasor measurement unit (PMU) communications
IEEE 1547	Physical and electrical interconnections between utility and distributed generation (DG)
IEEE 1686-2007	Security for intelligent electronic devices (IEDs)
NERC CIP 002-009	Cyber security standards for the bulk power system
NIST Special Publication (SP) 800-53, NIST SP 800-82	Cyber security standards and guidelines for federal information systems, including those for the bulk power system
Open Automated Demand Response (Open ADR)	Price responsive and direct load control
OpenHAN	Home Area Network device communication, measurement, and control
ZigBee/HomePlug Smart Energy Profile	Home Area Network (HAN) Device Communications and Information Model

*May 19-20 Workshop will determine what standards need to be developed to support the following:*

- FERC-identified priority applications:
  - Demand Response
  - Wide-Area Situational Awareness
  - Electric Storage
  - Electric Transportation
- Additional priority applications:
  - Advanced Metering Infrastructure
  - Distribution Grid, including Distributed Energy Resource Integration
- Cross-cutting priorities
  - Cybersecurity
  - Data networking

# *NIST analysis indicates many new standards are needed to support the FERC-identified priorities*

SG Area	Function	Standards	
		Existing	New
Demand Response	Time Differentiated Pricing		X
	Eventing - contracted demand response		X
	Load Control	X	X
	Bidding		X
	Load Shed Feedback	X	X
	Load Shed Forecasting		X
	Realtime meter data (demand - kW, consumption - kWh, power quality, etc.)	X	X
	Facilities Planning		X
	Heating, Ventilation, and Air Conditioning (HVAC) and Lighting Control	X	X
	Monitor customer energy use over time for trend and efficiency analyses		X
	Bidirectional weather service		X
	Premises Control		X
	Resource Control		X
Energy Measurement	X		
Resource Measurement		X	

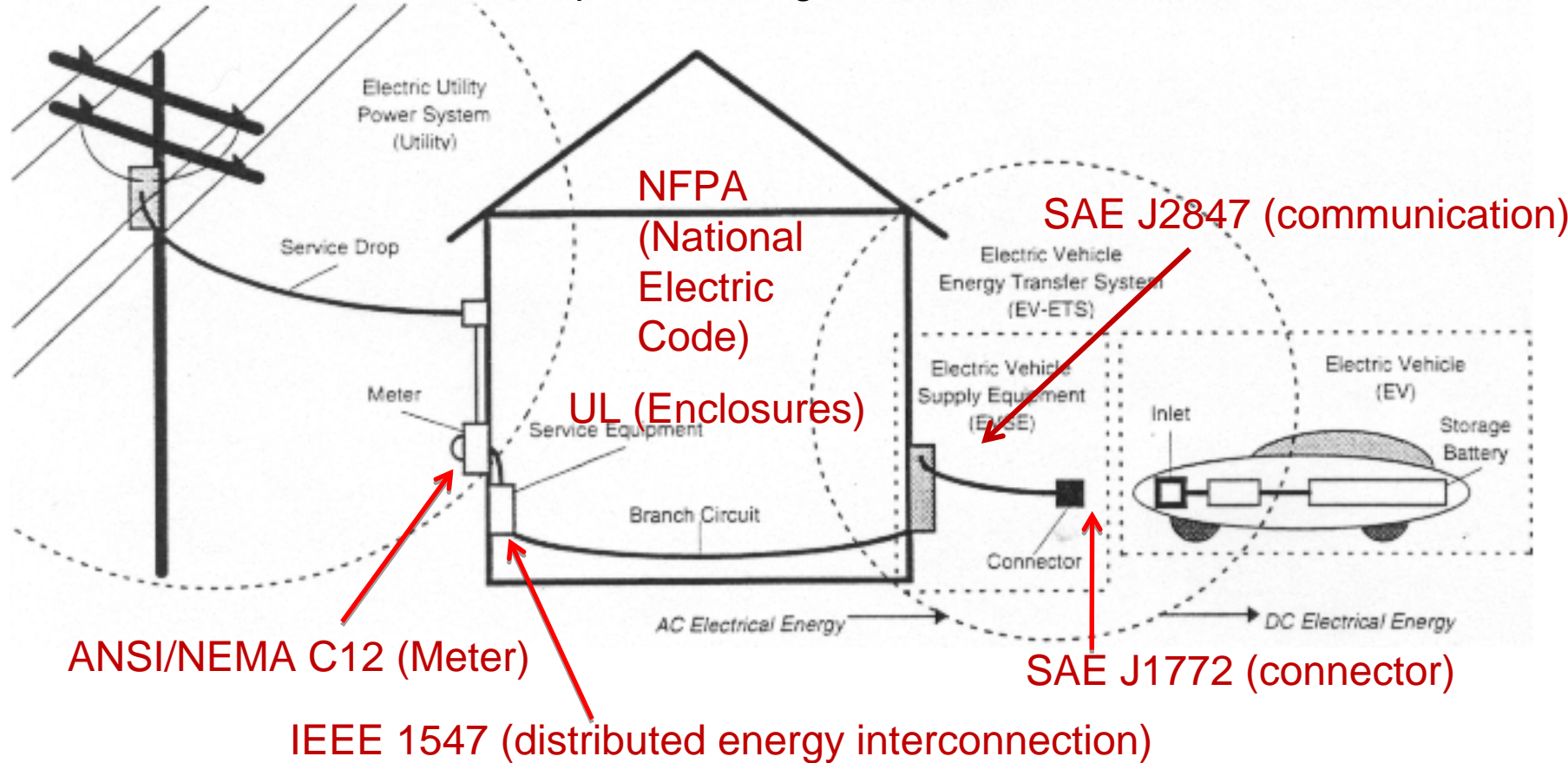
SG Area	Function	Standards	
		Existing	New
Wide Area Situational Awareness	Phasor measurement unit communication	X	X
	System restoration strategies		X
	State estimation/monitoring		
	Condition-based monitoring		X
	Time sequencing of events		X
	Contingency analysis		X
	Transient stability		X
	Remedial action schemes		X
	Fault location, isolation, and restoration		X
	Electric Transportation, Electric Storage	Power Charge Management	
Power Injection Management			
Operations and Maintenance Management			
Charge metering			
Cybersecurity	Cross-cutting	X	X

Each “x” represents multiple standards. It is estimated that over 100 individual new or revised standards will be needed.

Source: NIST analysis

# Example: Plug-in Hybrid Electric Vehicle – Grid Interface

Coordination is required among several standards bodies



Additional standards will be needed for: communications/Information protocols for charge management, power injection management, operations and maintenance, metering, roaming.

# Workshop Structure

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- Nearly 700 participants
- Industry, federal and state government
- Six parallel tracks (one per priority application)
- Breakout sessions within each track
- Individual participants assigned to sessions based on expertise and stakeholder category
- Special sessions on cybersecurity and networking





## *Additional Ways to Participate*

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- NIST Smart Grid Web Portal:  
<http://www.nist.gov/smartgrid>
- Twiki (linked from the portal): working documents and opportunity to post comments
- Email: [smartgrid@nist.gov](mailto:smartgrid@nist.gov)

## *Phase 2: Standards Panel*

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- Launch Smart Grid Interoperability Standards Panel by Year End 2009
- Representation from all stakeholder groups
- Administered by private sector organization
- RFP in May 2009
- Functions:
  - Evolve Roadmap
  - Ongoing coordination
  - Ensure implementation

# *A Once In A Lifetime Opportunity!*

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And Now....Questions?