



U.S. Department of Energy

Office of Electricity Delivery and Energy Reliability

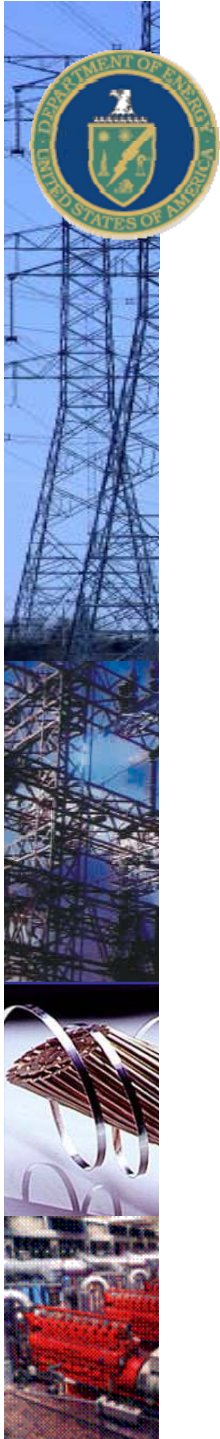
*Evolution and Progress
of Smart Grid Development
at the Department of Energy*

Eric Lightner

Director, Smart Grid Task Force

Presented at FERC/NARUC Smart Grid Collaborative Workshop

July 23, 2008

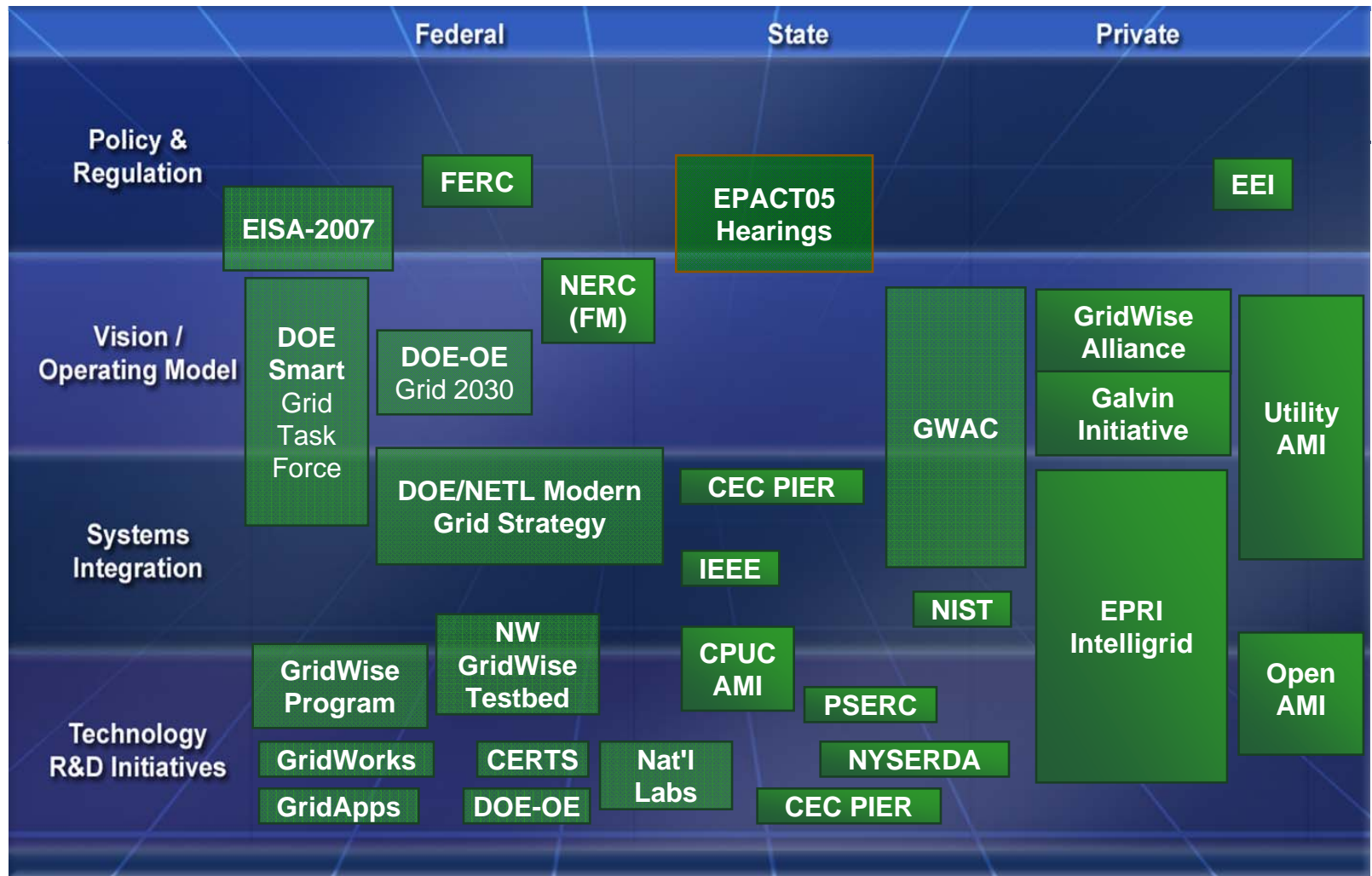


Presentation Outline

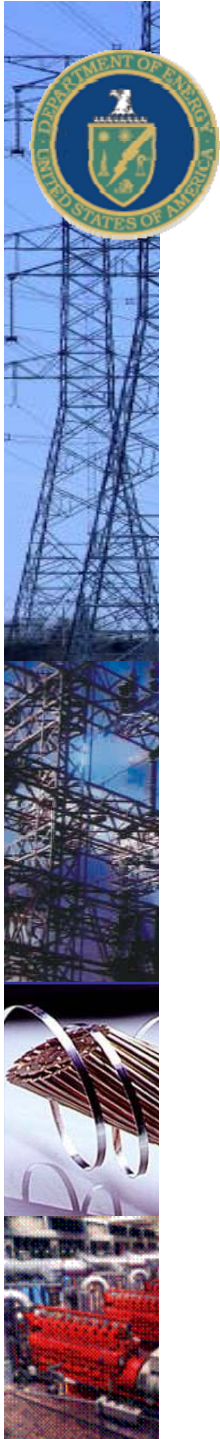
- **Defining Smart Grid**
- **Developing Metrics**
- **Defining Smart Grid RD&D Activities, Opportunities, & Challenges**
- **Stakeholder Communications & Outreach**
 - **Smart Grid: An Introduction**
 - **GridWeek 2008**
 - **E-Forums**
- **Meeting EISA Requirements**
 - **Interoperability Framework**
 - **Reports to Congress**



Identifying Organizations Working on Smart Grid



A continually expanding landscape



Defining Smart Grid

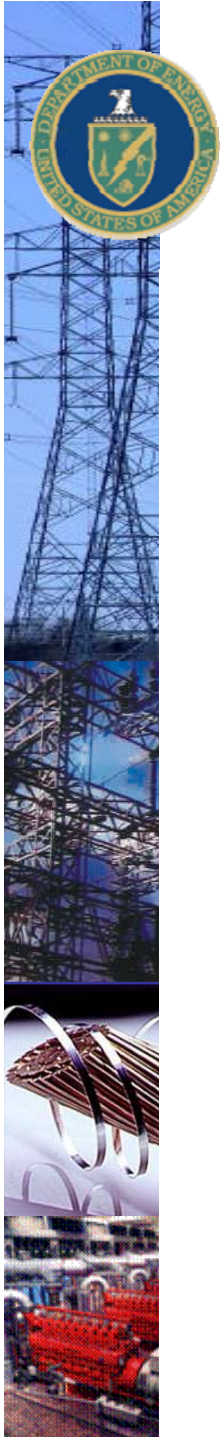
Activity	Outcome
Regional Meetings 2005-2007	Regional meetings were convened by the NETL Modern Grid Strategy team; these stakeholders created a definition of a smart grid and defined its value creation
Smart Grid Implementation Workshop: June 19-20, 2008	National workshop reaffirmed smart grid characteristics, and developed criteria and metrics for evaluating progress toward implementation



Smart Grid Implementation Planning Committee Organizations (illustrative)



National Laboratories



Defining Smart Grid

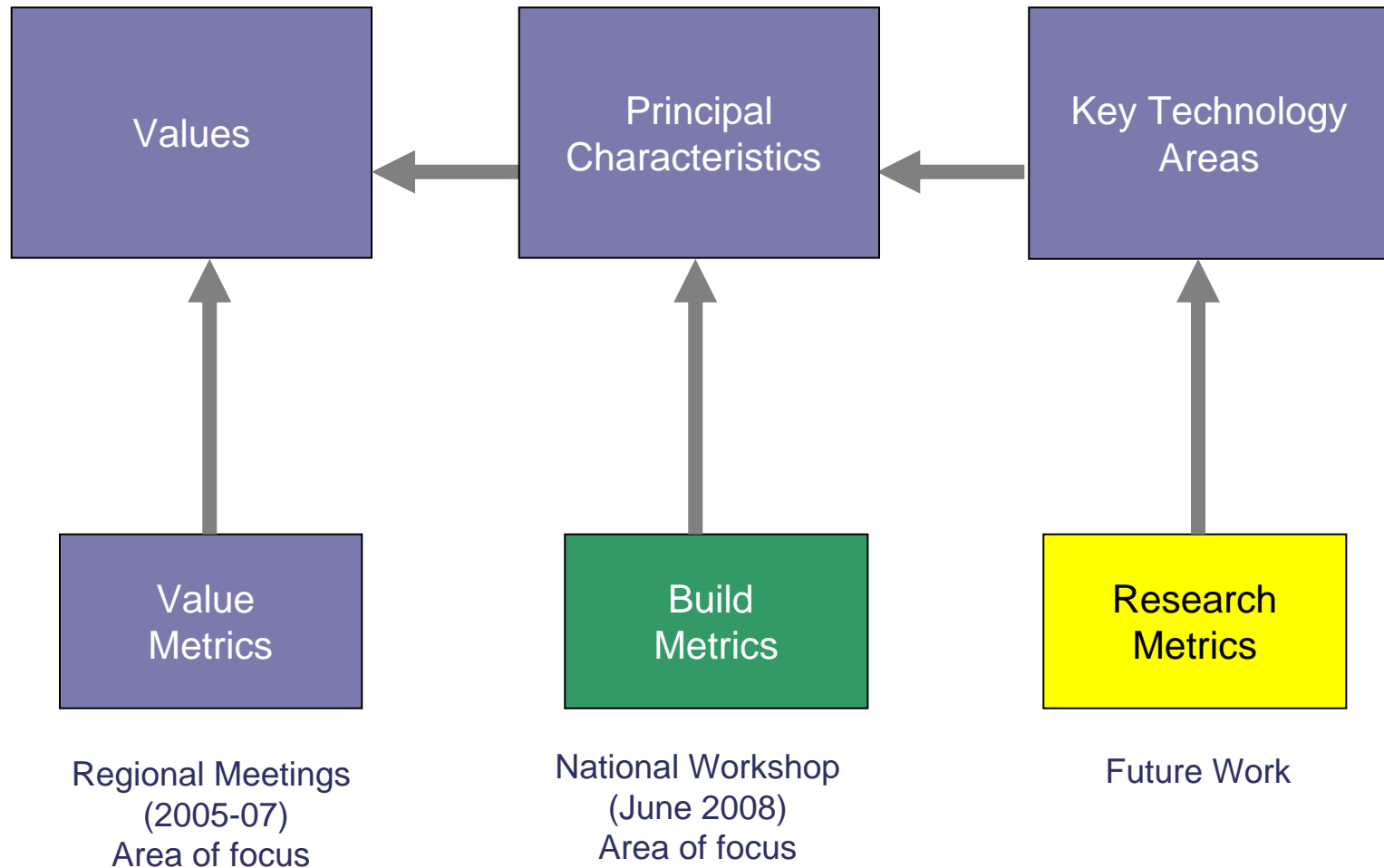
Electricity delivery network modernized using latest digital/information technologies to meet key defining functions

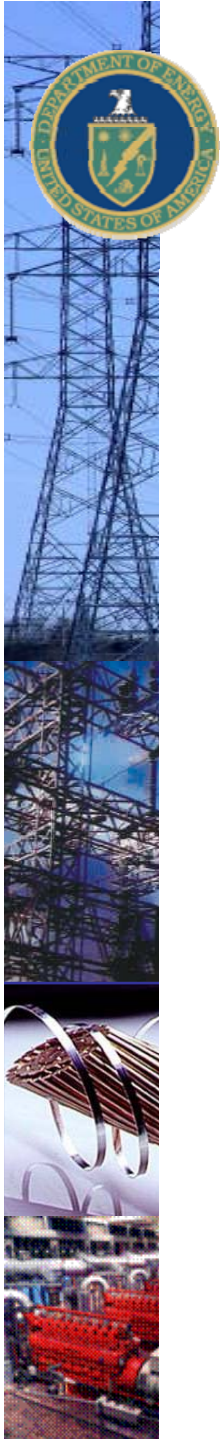
- Enable Active Participation by Customers
- Accommodate All Generation and Storage Options
- Enable New Products, Services, and Markets
- Provide Power Quality for the Digital Economy
- Optimize Asset Utilization and Operate Efficiently
- Anticipate and Respond to System Disturbances
- Operate Resiliently Against Attacks and Natural Disasters

7 smart grid characteristics reaffirmed through the Smart Grid Implementation Workshop held June 2008



Developing Smart Grid Metrics





Value Metrics Previously Developed by Many Organizations (illustrative)

Reliability

- Outage duration and frequency
- Momentary outages
- Power Quality measures

Security

- Ratio of distributed generation to total generation
- Number of consumers participating in energy markets

Economics

- Peak and average energy prices by region
- Transmission congestion costs
- Cost of interruptions and power quality disturbances
- Total cost of delivered energy

Efficient

- System electrical losses
- Peak-to-average load ratio
- Duration congested transmission lines loaded $>90\%$

Environmentally Friendly

- Ratio of renewable generation to total generation
- Emissions per kilowatt-hour delivered

Safety

- Injuries and deaths to workers and public



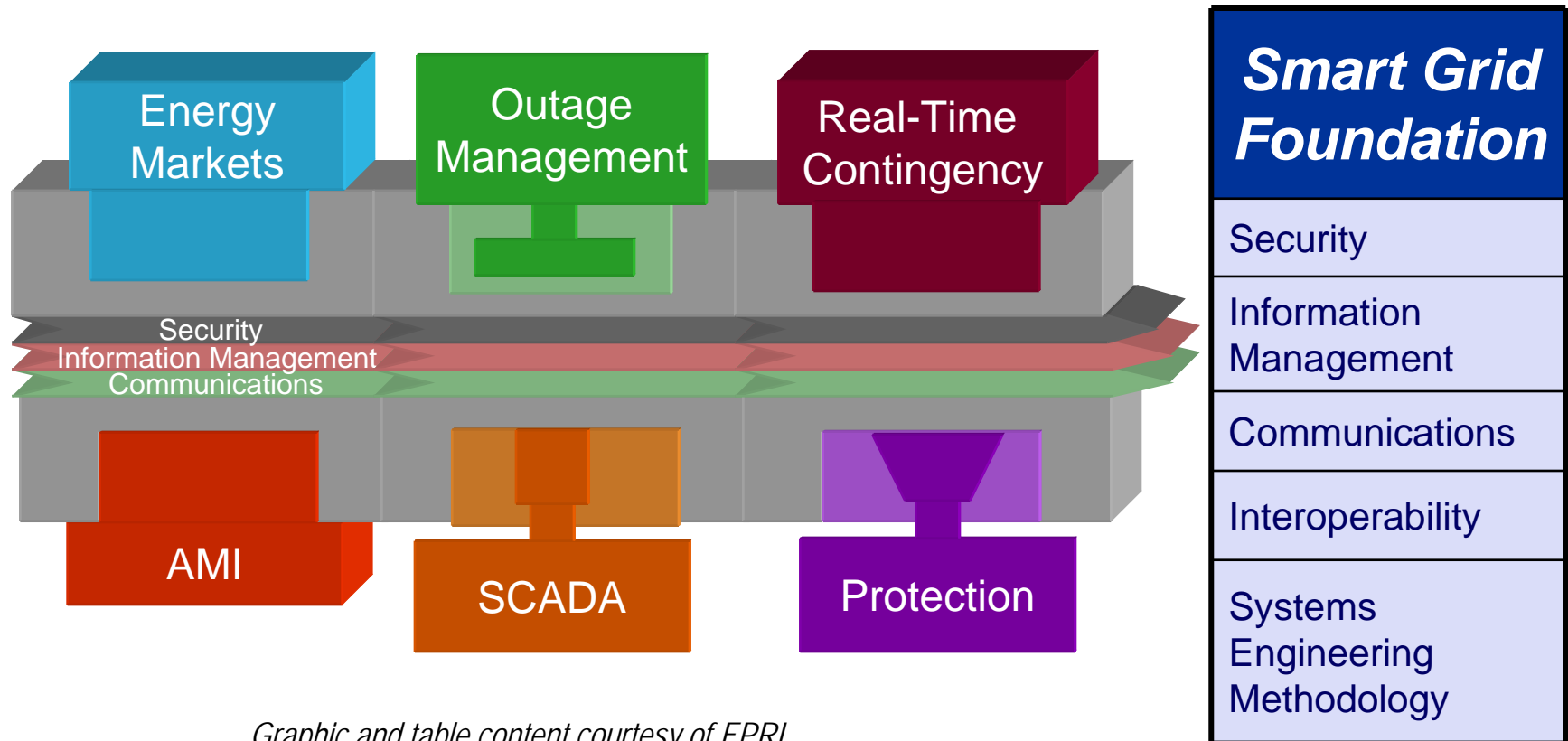
Workshop Developing Build Metrics

Characteristic-specific metrics:

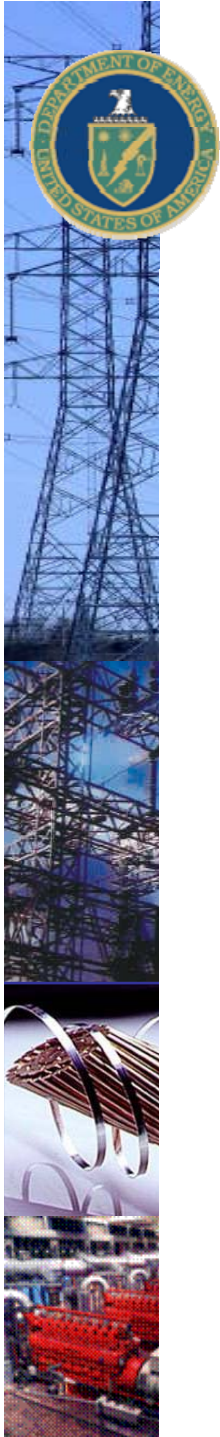
Tracking progress in build phase of each Characteristic toward its end state

Foundation metrics:

Tracking progress in building foundation for all 7 Characteristics



Graphic and table content courtesy of EPRI



Smart Grid Implementation Summary

Participants

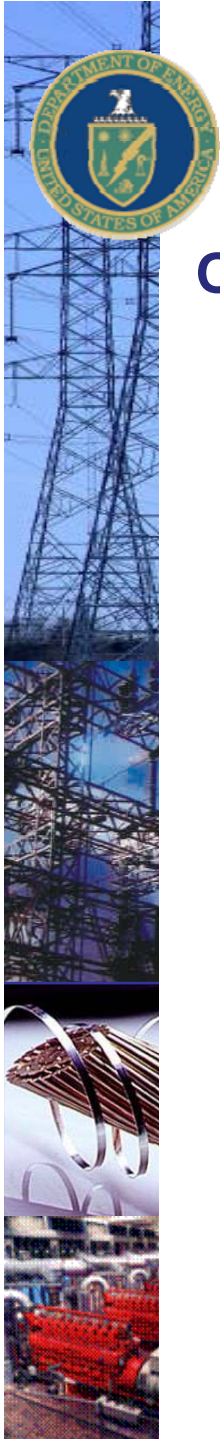
- >150 Smart grid experts and practitioners nominated by the Planning Committee
- Members of the Smart Grid Task Force and the Electricity Advisory Committee
- State regulators and energy program officers

Objectives accomplished

- Open stakeholder based process achieved
- Smart Grid characteristics reaffirmed
- Build metrics largely developed with measuring issues identified

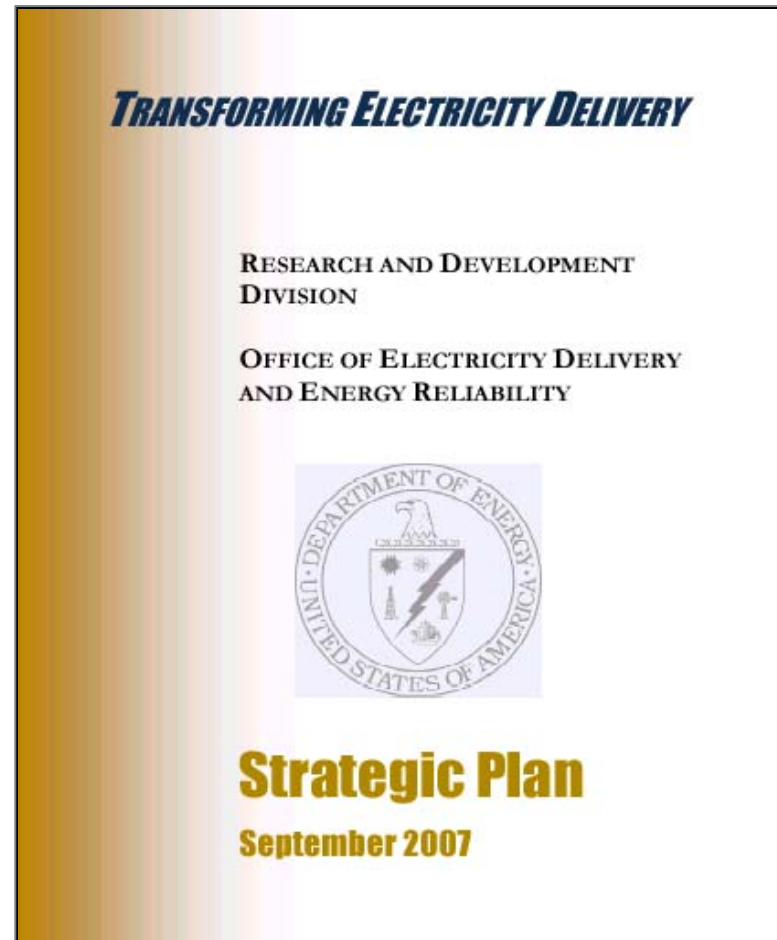
Product and Outcome

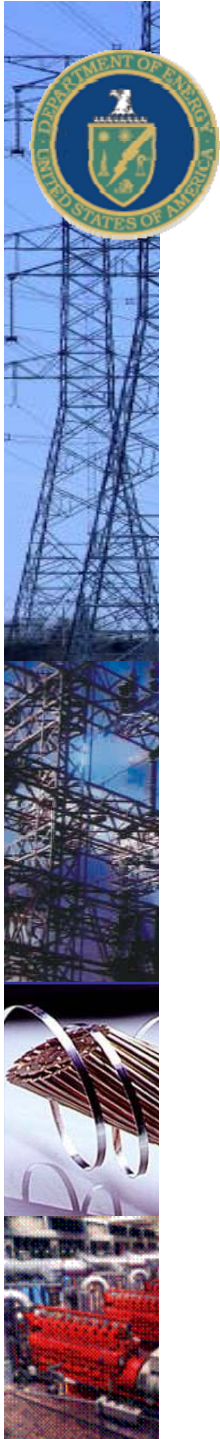
- Workshop report being reviewed by all participants before publication for public access
- Developed metrics being used in documenting status of smart grid system deployments and for use in further defining RD&D pathways



Defining Smart Grid RD&D Activities, Opportunities, & Challenges

OE R&D Strategic Plan identified smart grid and climate change as the unifying themes for its strategic opportunity areas

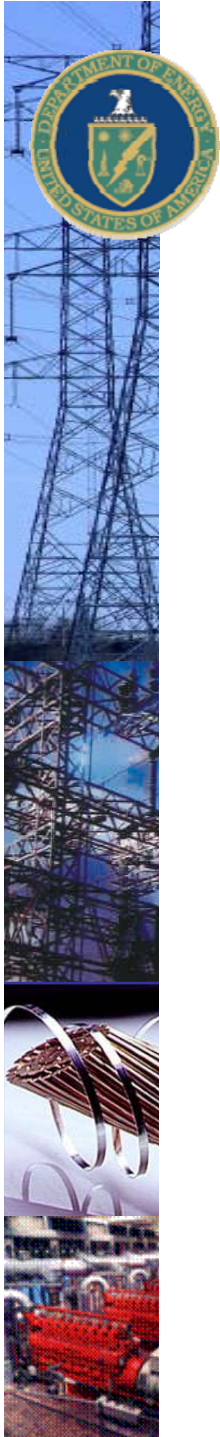




Defining Smart Grid RD&D Activities, Opportunities, & Challenges

Follow-on Workshop to further assess gap areas, identify opportunities and challenges, and develop and prioritize RD&D pathways for the smart grid community is being planned for December 2008 or January 2009

- Following open stakeholder based process
- Planning committee being assembled with nominations by DOE programs and key stakeholder organizations
- Planning committee to develop Workshop topics, set agenda, and nominate participants
- Web-based venue in addition to the in-person Workshop to be presented to the Planning Committee to balance broad interest in participation and effectiveness of Workshop
- Workshop findings to inform industry, States, and DOE in smart grid RD&D



Stakeholder Communications and Outreach

Smart Grid: An Introduction

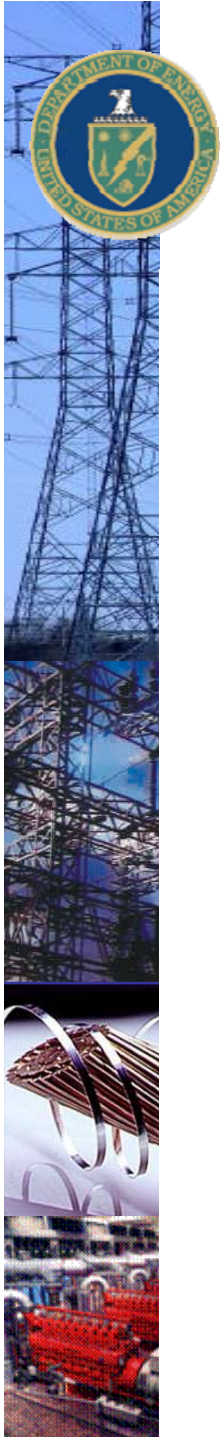
- An illustrative document on:
 - What is at risk for the grid as it stands
 - What is the smart grid
 - What is the value
 - How does technology fit in
- Scheduled for completion in September
- Lead Contractor: Litos Advertising & Design

GridWeek 2008, September 23-25, 2008 in DC

- GridWise Alliance and OE as co-chairs
- Becoming *the* national event on smart grid
 - Enabling energy efficiency
 - Smart Grid in a carbon economy
 - Future of Energy
 - Utility operational efficiencies
 - New business models
 - Interoperability of a Smart Grid
 - Securing the Smart Grid
 - Implementing EISA 2007
 - Smart Grid Success Areas
- International Smart Grid Summit in conjunction with GridWeek on September 22



www.gridweek.com



Stakeholder Communications and Outreach

Smart Grid E-Forums for information sharing and exchanges

- Conducted two DOE E-Forums, hosted by EEI, achieving broad participation by State commissioner staff and utility members
 - What is the Smart Grid, May 2008
 - The Smart Grid – Benefits and Challenges, June 2008
- DOE is assembling a Planning Group for devising & developing future E-Forum topics, including members:

APPA	NARUC	NEMA	EPA
NRECA	NERC	GWA	RAP
EEI	NRRI	ELCON	NASUCA
PJM	NCSL	EPRI	ASE



Smart Grid Interoperability Framework

NIST having primary responsibility for interoperability standards

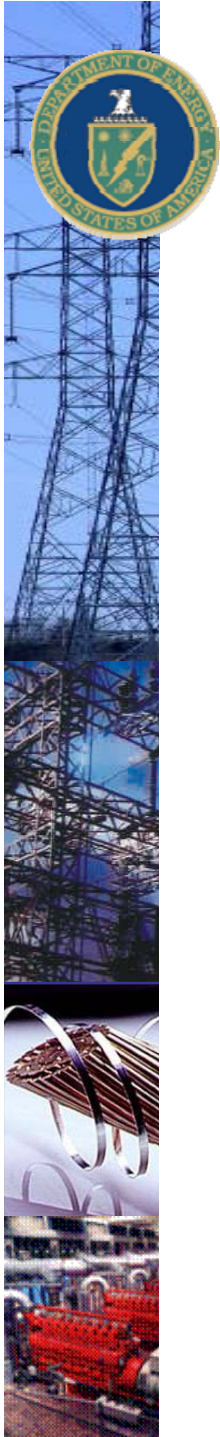
- **Input from**
 - FERC, OE, Smart Grid Task Force, other Federal & State agencies
 - GWAC, IEEE, NERC, NEMA, EPRI
- **Scope of framework**
 - Flexible to accommodate legacy systems
 - Technology neutral
 - Voluntary uniform standards for appliances and equipment for homes and businesses

GWAC leading the support for OE

- Held meeting with FERC Commissioner on interoperability
- Participating in the NIST Interop Framework Team meetings
- Providing GWAC developed materials, forum proceedings, and contact to help coordinate development

Interoperability Path Forward



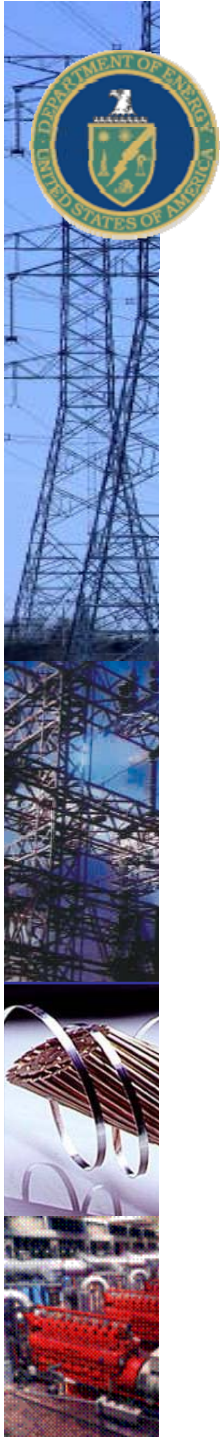


Reports to Congress: Section 1302 Smart Grid System Report

Requirements	Approach
<ul style="list-style-type: none">- Current status and prospects of smart grid deployment- ID of any regulatory or government barriers- Recommendations for State/Federal policies or actions (optional)- Analysis taking a regional perspective	<ul style="list-style-type: none">- Building on Implementation Workshop findings (characteristics & metrics) to guide smart grid status and projection analyses- Leveraging the APQC maturity model to assess key performance indicators of smart grid functions/practices- Coordinate with FERC/NARUC Smart Grid Collaborative on regulatory policies and on suggested recommendations

Status

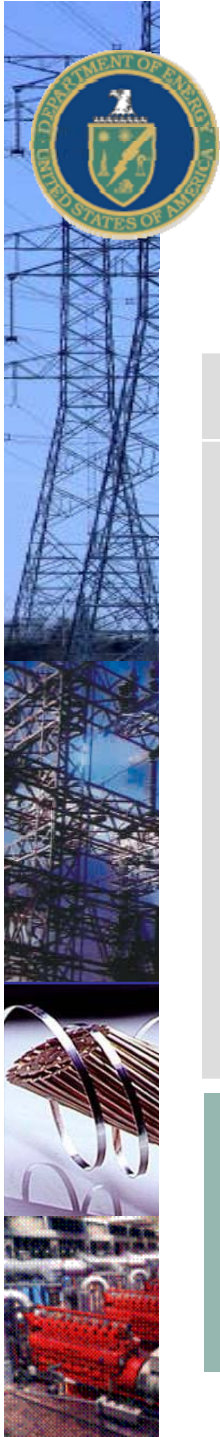
- On schedule to deliver the 1st draft for review in October, due 12/27/08 to Congress
- Lead Contractor: PNNL (incl. subcontract to APQC)



Reports to Congress:

Section 1308 Effect of Private Wire Laws on Development of CHP Facilities

Requirements	Approach
<ul style="list-style-type: none">- Consult with States and other entities- Evaluate purposes and effect of the laws- Determine impact of changing laws and regulations- Assess extent of duplication or redundancy due to privately owned wires	<ul style="list-style-type: none">- Assemble project review team- ID 4-8 key states for in-depth analysis- Develop interview questions/issues- Conduct 6-10 interviews in each category:<ul style="list-style-type: none">- With vendors/developers- With regulators and utilities- ID alternatives to CHP ownership of wires
Status <ul style="list-style-type: none">- On schedule to deliver the 1st draft for review in October, due 12/27/08 to Congress- Lead Contractor: Navigant Consulting	



Reports to Congress:

Section 1309 Security Attributes of Smart Grid Systems

Requirements

- Assess and determine impact of smart grid deployments on infrastructure security and operations
- Recommend on how smart grid can help in:
 - Reduced vulnerability
 - Restoration
 - Coordinated emergency responses
- Recommend on risk mitigation

Approach

- Work in coordination with DHS/FERC/NERC on SOW development

Status

- Proposals from national laboratories due August 10, followed by review by Smart Grid Task Force
- Report due 6/27/09

Summary

- **Many Smart Grid planning, implementation, and awareness activities being undertaken by DOE**
 - **Smart Grid Task Force in coordination with Smart Grid Subcommittee of Electricity Advisory Committee**
 - **In collaboration with key industry organizations (e.g., GWA, EPRI, and other member organizations on various planning committees)**
 - **In support of NIST on interoperability framework development**

- **Many activities benefiting from FERC/NARUC Smart Grid Collaborative participation; some needing direct engagement**
 - **Opportunity to recommend any State/Federal policies or actions to facilitate transition to a smart grid, for inclusion in Smart Grid System Report**
 - **Open for mutual engagements in all planned activities**

