

Smart Grid Implementation by DOE Relating to the Energy Independence and Security Act of 2007

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Office of Electricity Delivery and Energy Reliability

This Presentation is adapted from a recent presentation by Eric Lightner, Director of Smart Grid Task Force, at:

***Federal Smart Grid Task Force
Kickoff Meeting***

March 20, 2008



OE Actions on Implementing Title XIII of the Energy Independence and Security Act of 2007

- **Establish a Smart Grid Advisory Committee (By 3/29/2008)**
- **Establish a Smart Grid Task Force (By 3/29/2008)**
- **Submit to Congress a report concerning the status of Smart Grid system deployments (Due 12/19/2008)**
- **Submit to Congress a study assessing laws and regulations affecting siting of privately owned electricity distribution wires on and across public rights-of-way (Due 12/19/2008)**
- **Carry out a program to research, develop, and demonstrate Smart Grid technologies (Planned 1st Q-FY09 following development of RD&D plan)**
- **Establish a Smart Grid regional demonstration initiative showcasing advanced technologies (Planned 1st Q-FY09, guided by RD&D plan)**
- **Establish a federal matching funds program (By 12/29/2008)**
- **Submit to Congress a quantitative assessment concerning the security implications of Smart Grid system deployments (Due 6/19/2009)**





Smart Grid Task Force

Functions

- Serves as Federal focal point on all things “smart grid”
- Coordinates and integrates inter-governmental activities
- Oversees report production for submission to Congress
- Oversees development of smart grid RD&D plan
- Guides smart grid regional demonstrations
- Advises on interoperability framework
- Guides establishment of the federal matching funds program
- Develops tech assistance plan to States and guides plan implementation
- Guides outreach and communications to build awareness and educate decision makers
- Collaborates with and supports Electricity Advisory Committee

Members

- OE:** leadership, RD&D, policy analysis, infrastructure protection
- FERC:** wholesale markets
- NIST:** interoperability standards
- EERE:** energy efficiency and renewables
- DHS:** homeland security
- DoD:** national security
- EPA:** environmental issues
- USDA:** rural electricity development





Defining Smart Grid

Activity	Outcome
Regional Meetings	Regional meetings were convened under the Modern Grid Strategy project of the National Energy Technology Laboratory (NETL); these stakeholders have created a definition of a smart grid
Smart Grid Implementation Workshop: June 19-20, 2008	The Workshop will serve as an important first step in reaching a common understanding of smart grid characteristics, the value created for the electric system, consumers, and society, and to jointly define criteria and metrics for evaluating progress toward implementation
Defining the Smart Grid	OE is developing a Smart Grid book that will address the following questions: <ul style="list-style-type: none">What is the Smart Grid?What is the value?Why it is necessary?Who are the “key” players?



Defining Smart Grid

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

- ❑ Enabling active participation by consumers
- ❑ Accommodating all generation and storage options
- ❑ Enabling new products, services, and markets
- ❑ Optimizing assets and operating efficiently
- ❑ Anticipating and responding to system disturbances in a self-healing manner
- ❑ Operating resiliently against physical and cyber attack and natural disasters
- ❑ Providing the power quality for the range of needs in a digital economy

The evolution of a smart grid will be one of continuous improvement.

** Identified through the Modern Grid Strategy development efforts led by the NETL project team*



Smart Grid Implementation Workshop

Planned for June 19-20, 2008, in DC, with broad stakeholder engagement to reach consensus on and acceptance of:

- Smart Grid characteristics and values
- Metrics for measuring progress toward a smart grid
- Measurement and verification



Input to:

- Smart Grid baseline and progress tracking
- Smart Grid RD&D Plan development
- Soliciting and selecting smart grid regional demo activities

A Planning Committee comprising a broad representation of smart grid stakeholders is being charged to organize the Workshop.

Smart Grid Implementation Planning Committee Organizations (illustrative)



National Laboratories

Interoperability Protocols & Standards

IEEE 1547 Series of Interconnection Standards

- **Standards Development, NREL**
 - IEEE 1547 Series of Standards & UL 1741 Interconnection Equipment
- **Validation Testing to Support Standards Development, DUA**
 - Distributed Utility Integration Test
- **Regional Implementation, NREL**
 - Model interconnection procedures for PJM and MISO

GridWise Architecture Council, PNNL

- **Establish principles and concepts for interaction between participants and interoperability between technologies and systems**

Interoperability Path Forward





Tech Assistance to States

- OE working with State regulators to formulate State strategies for modernization
 - Promoting deployment of smart grid technologies
 - Focusing on business case model
 - Providing feedback into State program direction and performance
 - Suggesting regulatory actions to address barriers
 - Supporting, and supported by, WV/OH/MO regulators



Input to:

Tech assistance plan to support States in developing and implementing smart grid pathways





Communications and Outreach for Public Awareness

GridWeek 2007, April 2007 in DC

- Aligning and coordinating national agenda on grid modernization
- 634 participants, including federal/state/industry/Lab leaders
- Inaugural event organized and sponsored by OE



<http://www.gridweek.com>

GridWeek 2008, September 23-25, 2008 in DC

- GridWise Alliance and OE as leading sponsors
- 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

Smart Grid Newsletter

Monthly publication covering news, trends, research and marketplace information relevant to grid automation (<http://www.smartgridnews.com/>)



Key Smart Grid R&D Technology Areas by OE

- **Improving system efficiency-increase capacity, reducing losses**
 - Wire development
 - Cables and other devices
- **Improving self-healing and resilience from attacks**
 - Real-time monitoring, advanced algorithm development
 - Situational awareness tool
 - Advance control systems (security / interoperability)
- **Improving load management, power quality, and faster grid operations**
 - Storage demonstrations and advanced storage materials
 - High-voltage power electronics (switches)
- **Improving asset utilization, generation diversity, consumers empowerment**
 - Renewable and distributed systems integration (including distributed generation, plug-in hybrids, microgrids, demand response)



Examples of OE Activities on Enabling Consumer Participation

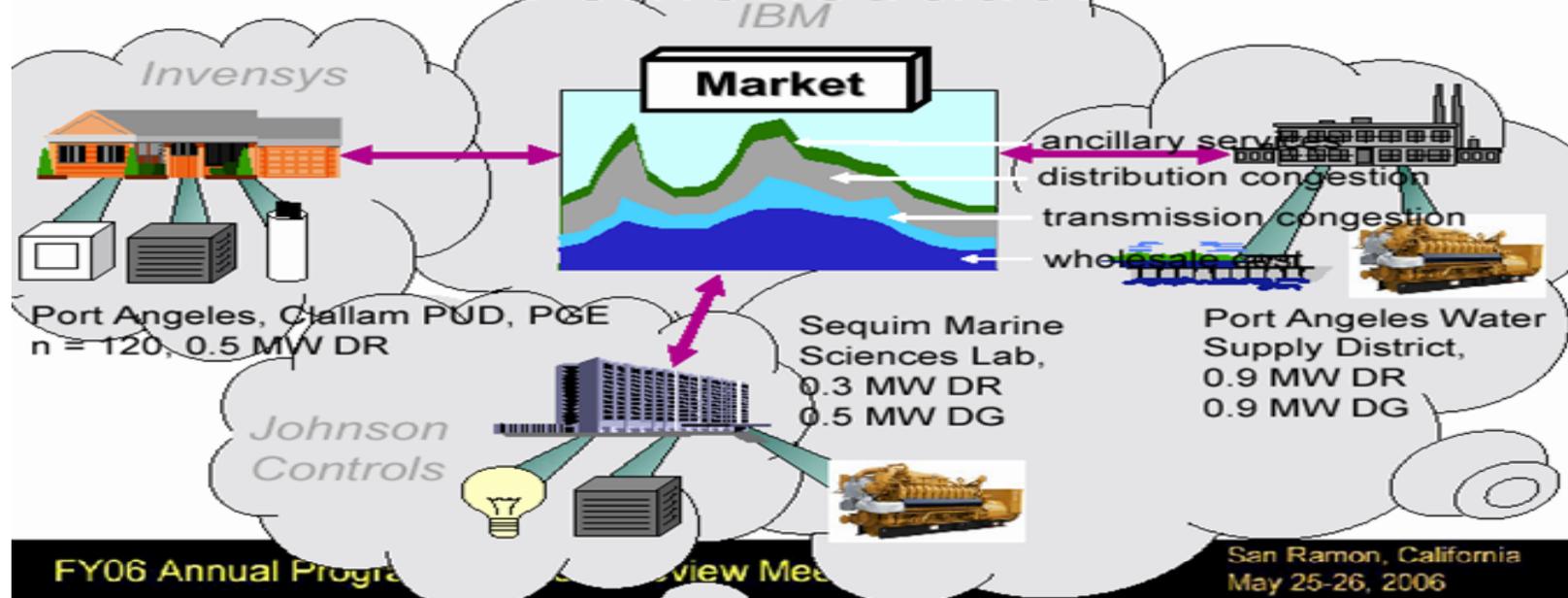
Pacific Northwest GridWise Testbed Demonstration, PNNL

Conduct the Olympic Peninsula GridWise Demand Response Demo and the Grid Friendly™ Appliance demo to illustrate how the transformed power grid will function and to explore key operational issues

GridWise Demonstration in NM, UNM

Combine use of smart buildings, smart meters, thermal storage, renewable energy and distributed generation for smart buildings/grid integration

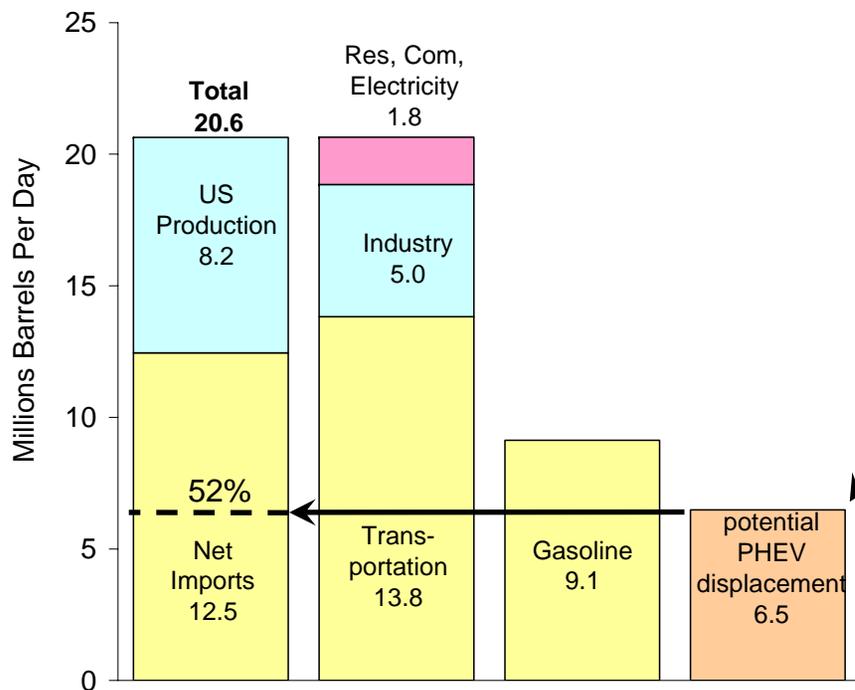
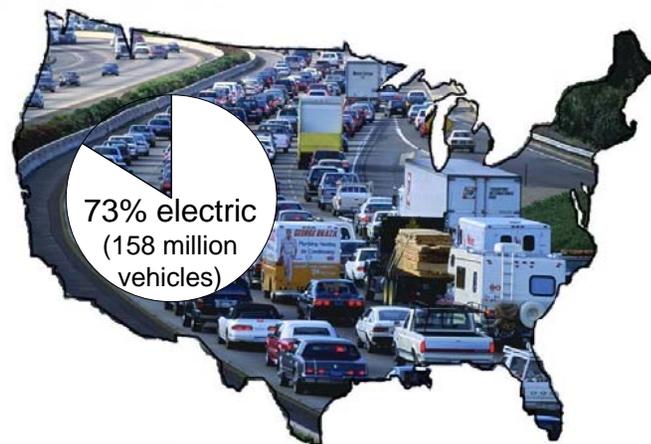
Olympic Peninsula GridWise Demonstration



Example of OE Activity Relating to Enabling New Services

PHEV Impact Analysis, PNNL

- **The idle capacity of the U.S. grid could supply 73% of the energy needs of today's cars, SUVs, pickup trucks, and vans...**
- **without adding generation or transmission if vehicles are charged off peak**



Source: EIA, Annual Energy Review 2005

- Potential to displace 52% of net oil imports (6.7 MMBpd)
- More sales + same infrastructure = downward pressure on rates
- Reduces CO₂ emissions by 27%
- Emissions move from tailpipes to smokestacks (and base load plants) ... cheaper to clean up
- Introduces vast electricity storage potential for the grid



New OE Activities Supporting Smart Grid Characteristics

Awards (to be) selected from competitive FY07 solicitation, DE-PS26-07NT43119

- Program Area 1: Five projects awarded addressing cyber security of control systems
- Program Area 2: Projects to be awarded of \$30+ M of total DOE funding over 5 years in renewable and distributed systems integration for peaking power and other ancillary services, including sub-areas in low-cost sensors, distribution automation, and consumer information gateway development



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