

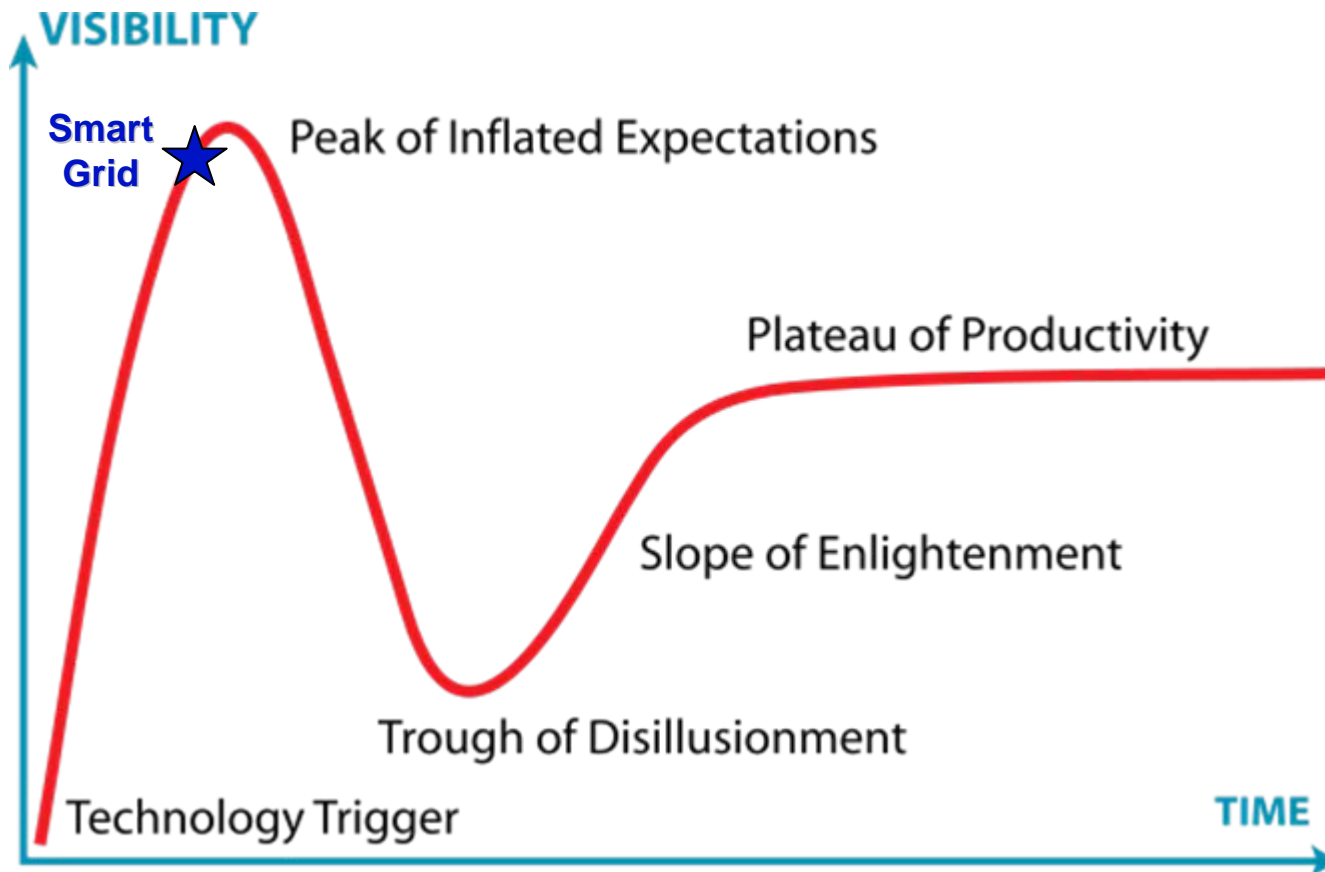
Smart Grid

CEE Program Meeting

Omar Siddiqui

June 4, 2009

Smart Grid: Hype Versus Reality



How to Define “Smart Grid”?



Many Contributors Have Led to Varied Definitions



Federal SmartGrid Task Force

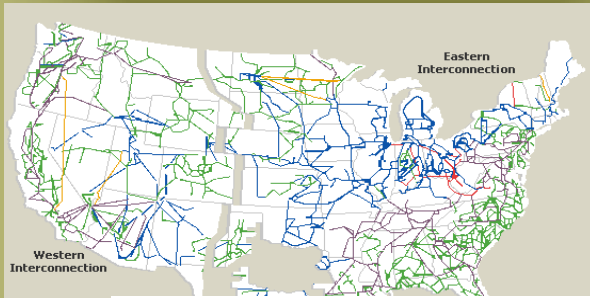


Intelligent Grid Coordination Committee



Diverse Focus Areas of “Smart Grid”

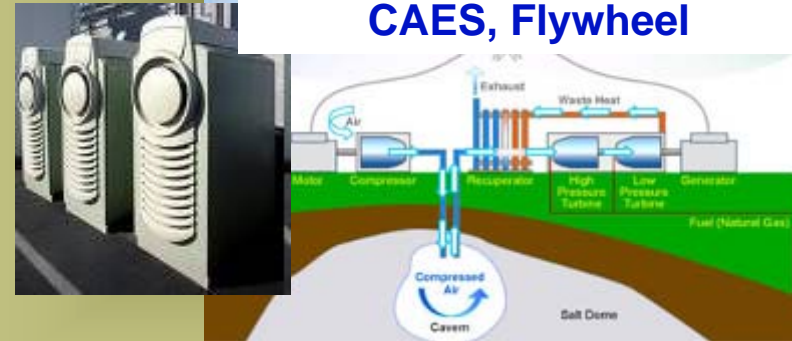
Intelligent Transmission and Distribution Automation?



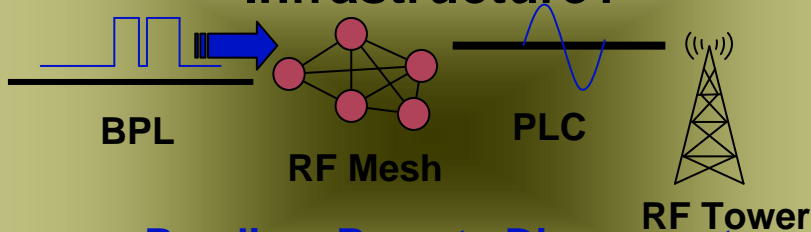
Microgrids, Islanding, Switching, Sectionalizing

Distributed Generation and Storage?

PV, Wind, Micro-Turbines, CAES, Flywheel

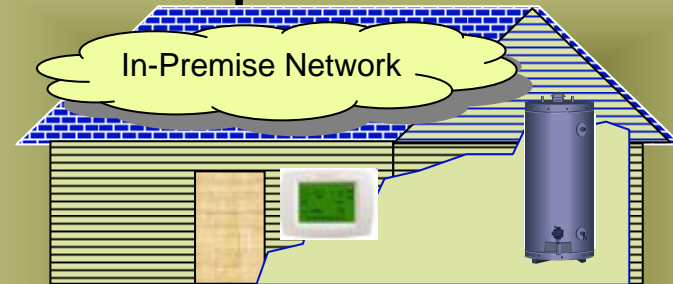


Advanced Metering Infrastructure?



Reading, Remote Disconnect, Capacitor Controls, Sensors, Wastewater

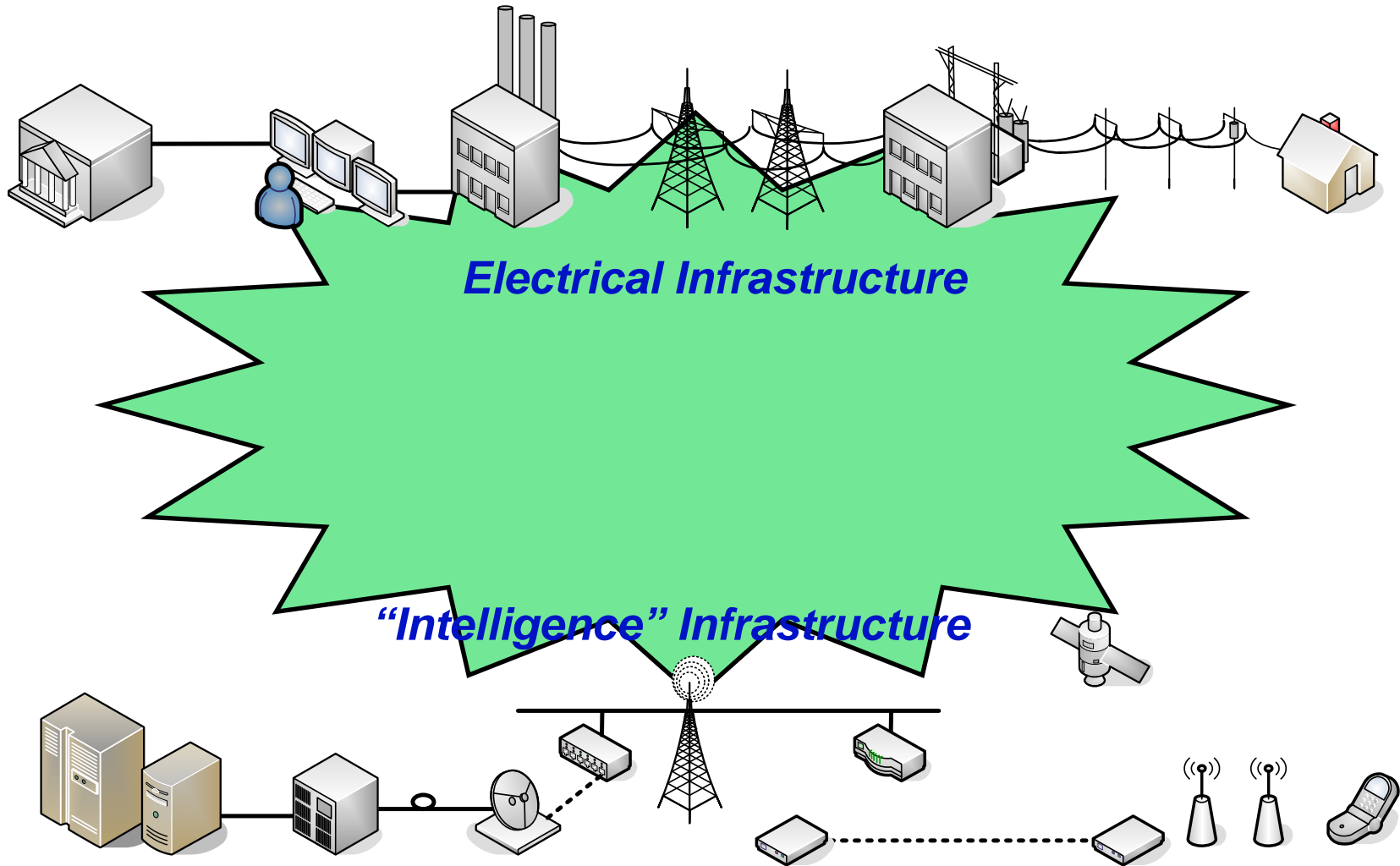
Demand Response & Load Control?



In Premise Networks, Automated DR, Integrated Demand-Side Resources

Achieving the Vision – A Smart Grid

Integrating Two Infrastructures



Achieving the Vision – A Smart Grid

Integrating Two Infrastructures

Transmission



**Phasor
Measurement**



Substation



**Condition
Monitoring**



Distribution



**Distribution
Automation**



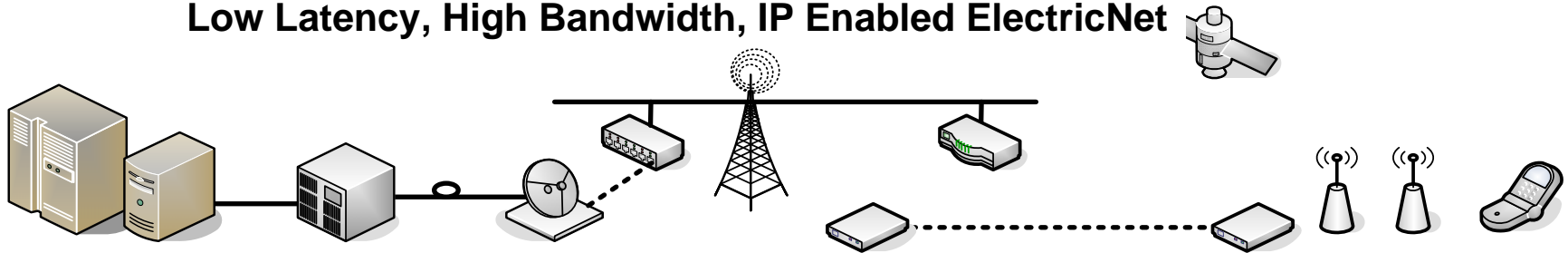
Consumer



**“Prices to Devices”
(Demand Response)**



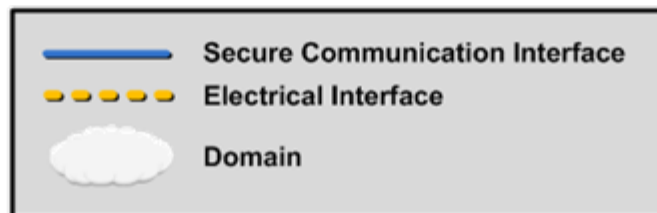
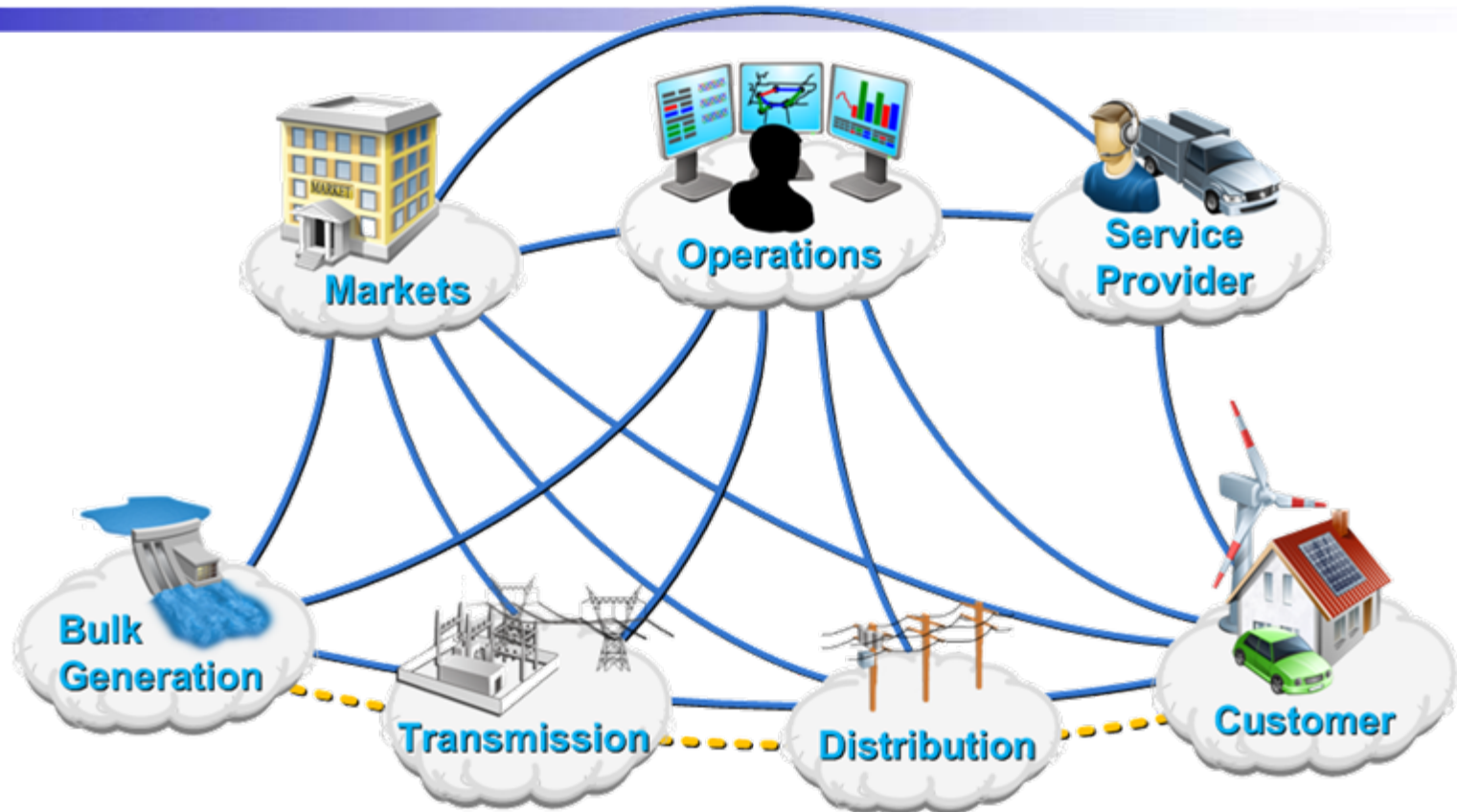
Low Latency, High Bandwidth, IP Enabled ElectricNet



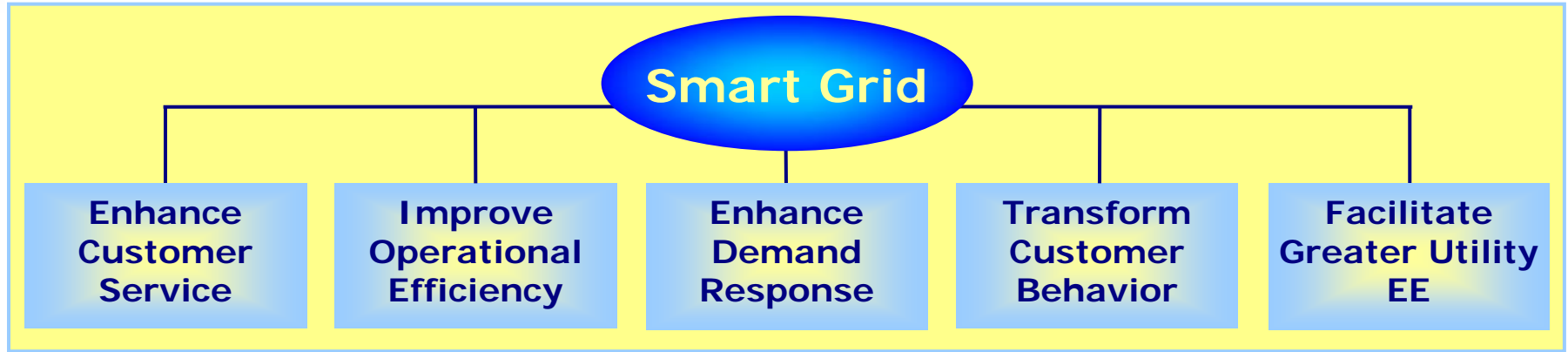
BPL, Wi-Max, Satellite, Fiber, DSL, Wi-Fi, RF Mesh, etc.



Smart Grid – Integration of Domains



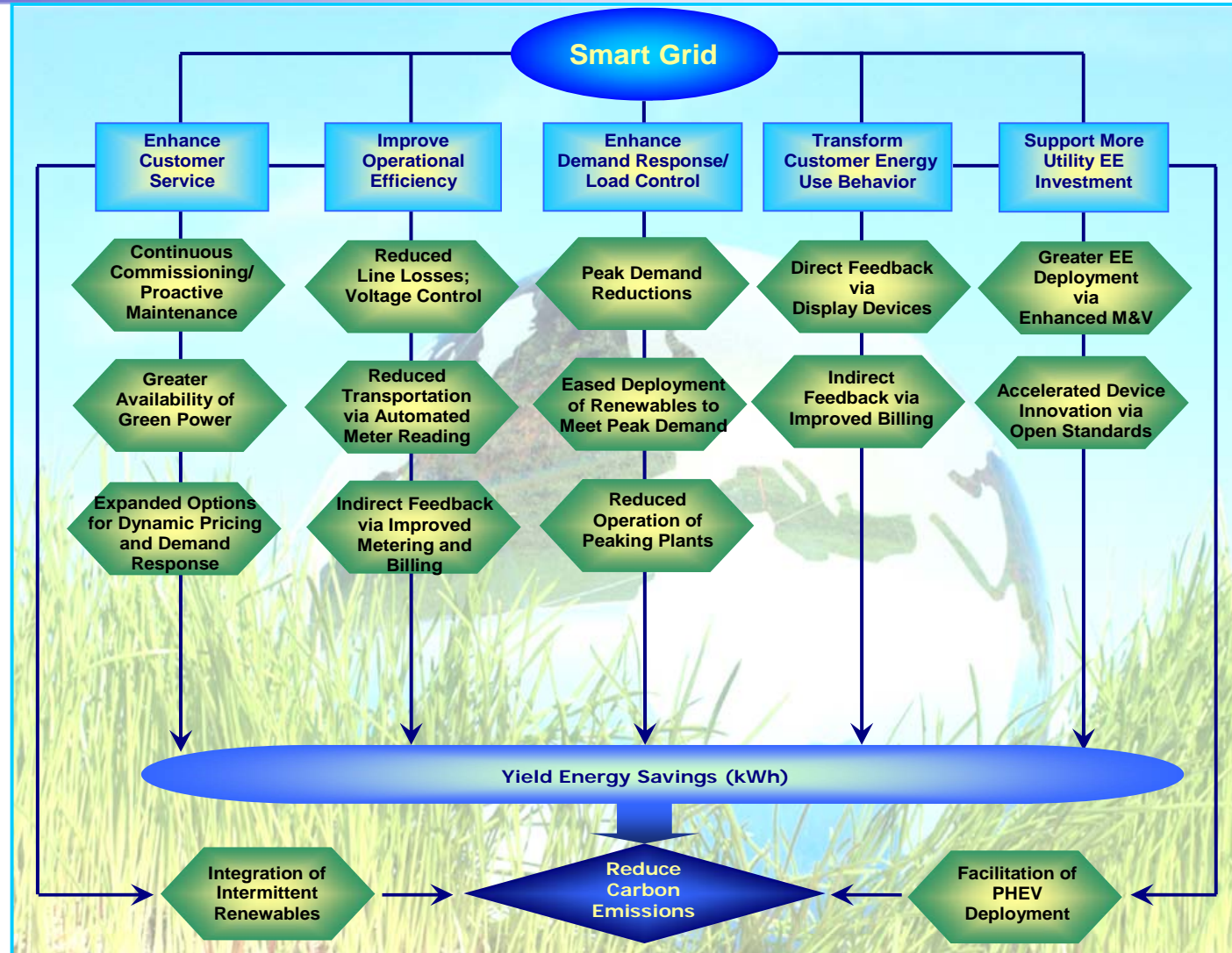
What are the Energy Efficiency & CO₂ Benefits of a Smart Grid?



Is a Smart Grid a Green Grid?

Potential Impact

- Annual energy savings: **56–203 billion kWh**
- Annual GHG emissions reduction: **60–211 million metric tons of CO₂ eq.**
- Equivalent to **removing 14 to 50 million cars** off the road annually



NIST Smart Grid Interoperability Standards Interim Roadmap Project

Goals

- Develop consensus-driven Interim Roadmap
- Identify process to develop and harmonize Smart Grid interoperability standards

April 28-29 Workshop

- Over 400 stakeholders worked in 7 tracks to begin consensus building and identify existing standards
- Discussed Architecture and Requirements
- Evaluated existing standards
- Consensus on Low Hanging Fruit (16 standards)

May 18: DOE/Commerce Press Release

- Announced list of 16 Release 1 Standards

NIST Smart Grid Interoperability Standards Interim Roadmap Project

May 19-20 Workshop

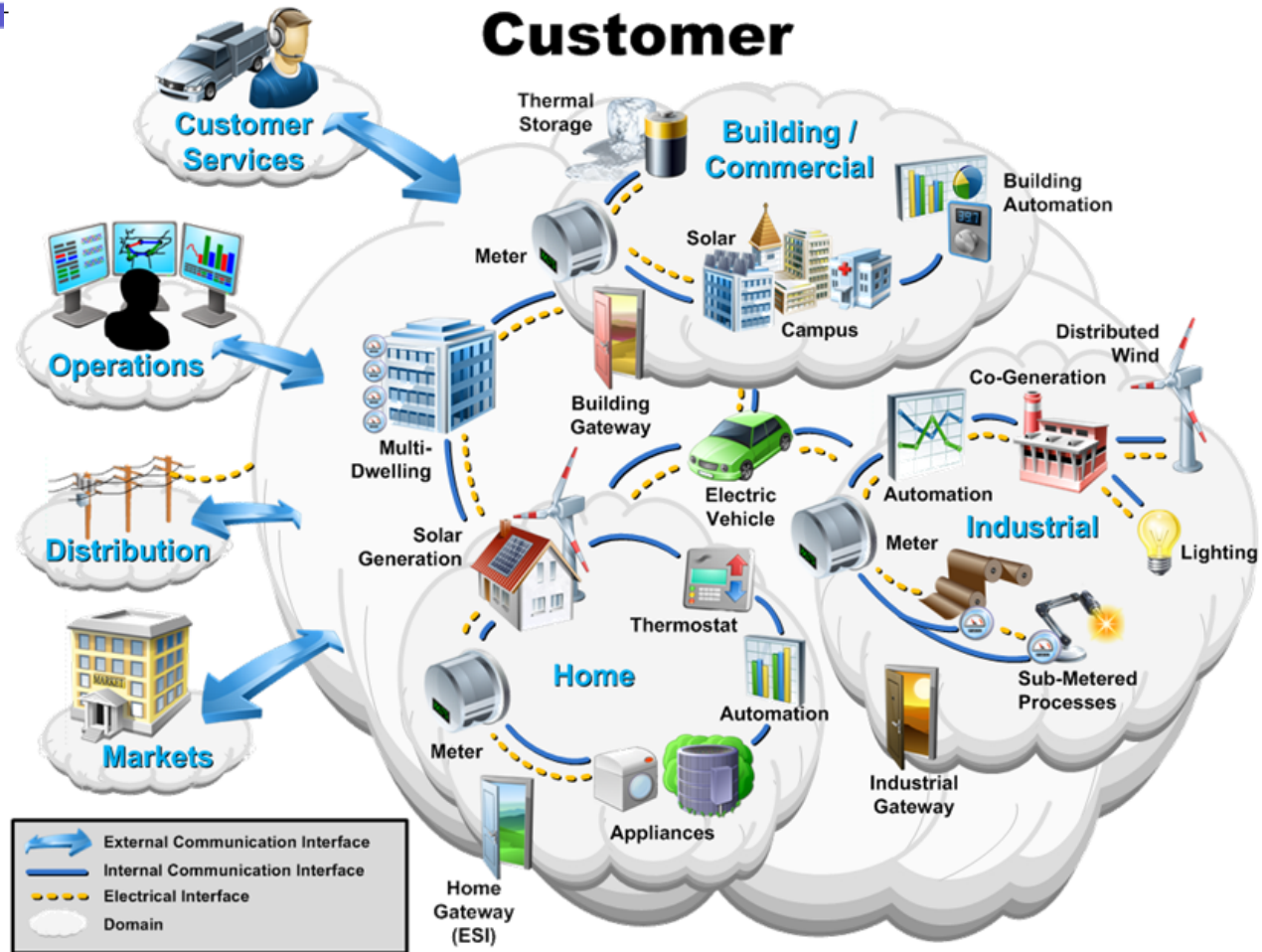
- Over 600 stakeholders worked to select interoperable standards for key interfaces between domains
- Secretary Chu (Energy) and Secretary Locke (Commerce) in attendance
- Focus on six priority SG applications
- Identify additional existing standards that meet requirements
- Identify new or revised standards needed
- When needed
- Who should develop

May 28 Deliver Interim Roadmap to NIST

June

- Work with Standards Development Organizations to implement Roadmap recommendations

Customer Domain



Applying a requirements-driven process to analyze standards against how well they meet the requirements

Initial Smart Grid Interoperability Standards Framework: “Low-Hanging Fruit” in Customer Domain

- **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
- **IEEE 1547**
 - Physical and electrical interconnections between utility and distributed generation (DG)
- **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 (2.0 pending)**
 - Home Area Network (HAN) Device Communications and Information Model

Initial List of “Low-Hanging Fruit” to recognize existing “standards” identified as important for customer applications

NIST Three Phase Plan

