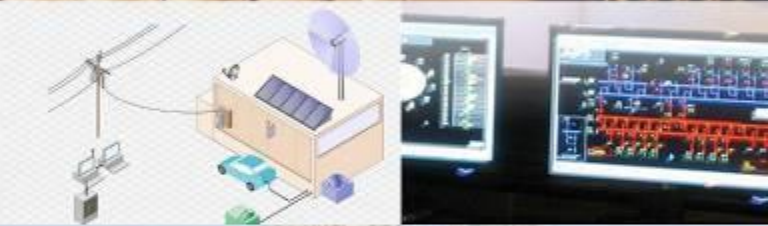




EPRI

ELECTRIC POWER
RESEARCH INSTITUTE



The “Smarter” Grid – What is it?



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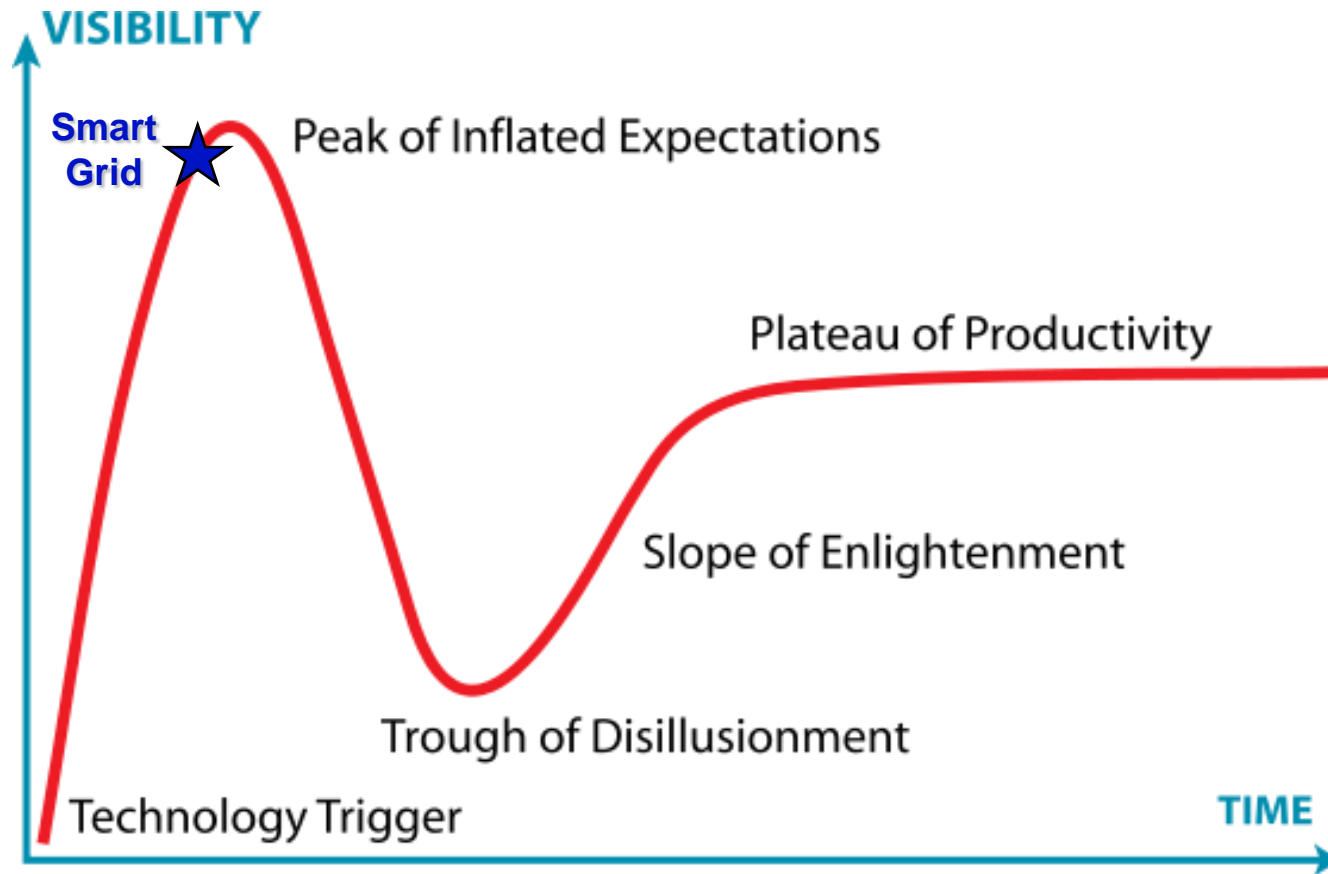


July 27, 2009

IEEE Power Meeting



The Gartner Technology Hype Cycle



We are in the stage of trying to move from hype to reality

How to Define “Smart Grid”?



Many different perspectives



Federal SmartGrid Task Force

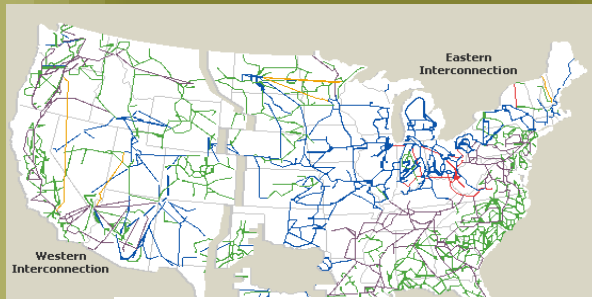


Intelligent Grid Coordination Committee



Diverse Focus Areas Have Led to Varied Definitions

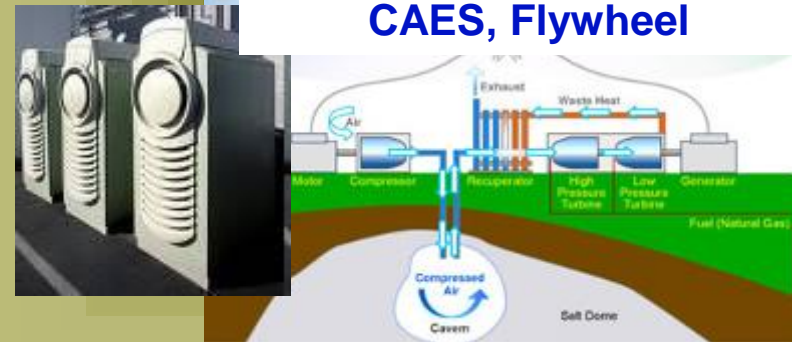
Intelligent Transmission and Distribution Automation?



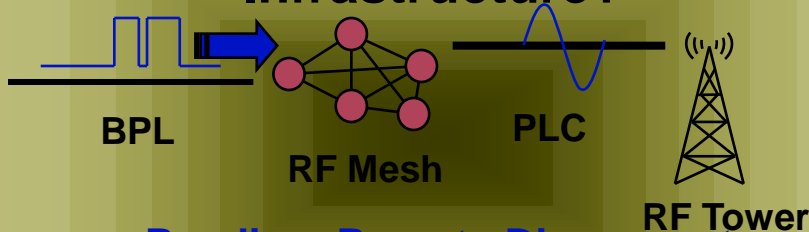
Microgrids, Islanding, Switching, Sectionalizing

Distributed Generation and Storage?

PV, Wind, Micro-Turbines, CAES, Flywheel

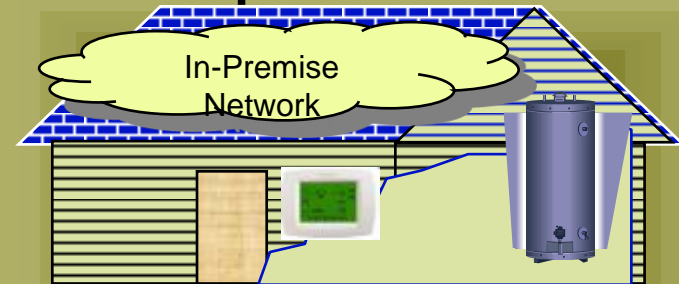


Advanced Metering Infrastructure?



Reading, Remote Disconnect, Capacitor Controls, Sensors, Wastewater

Demand Response & Load Control?



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

Many Definitions – But All Roads Pointing to: Sensors...Two Way Communication....Information Management....Intelligence

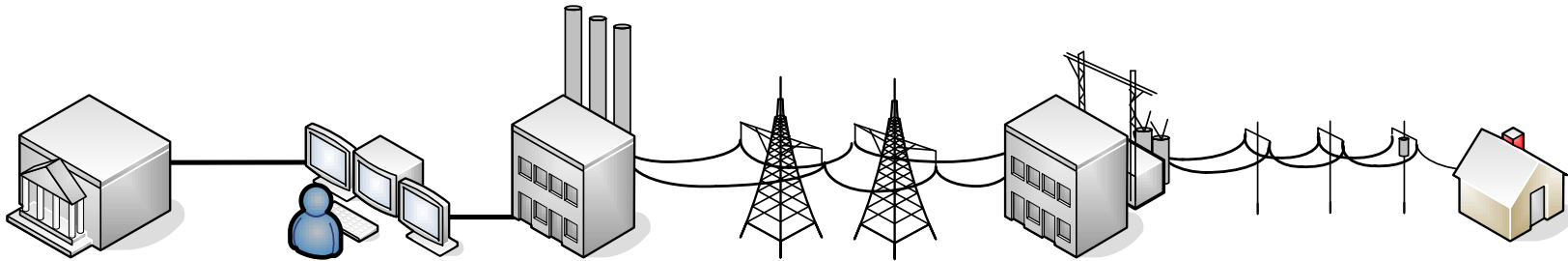
The Entire Electrical Power System
From Generation to End Use

- Engaging Consumers
- Enhancing Efficiency
- Ensuring Reliability
- Enabling Renewables

Highly
Instrumented
with Advanced
Sensors and
Computing

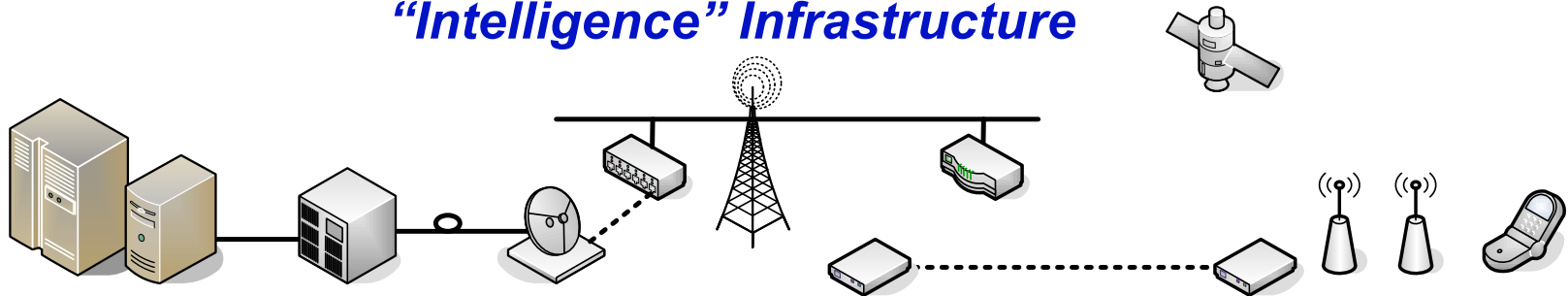
Interconnected by a
Communication Fabric
that Reaches Every
Device

The Smart Grid involves Merging Two Infrastructures

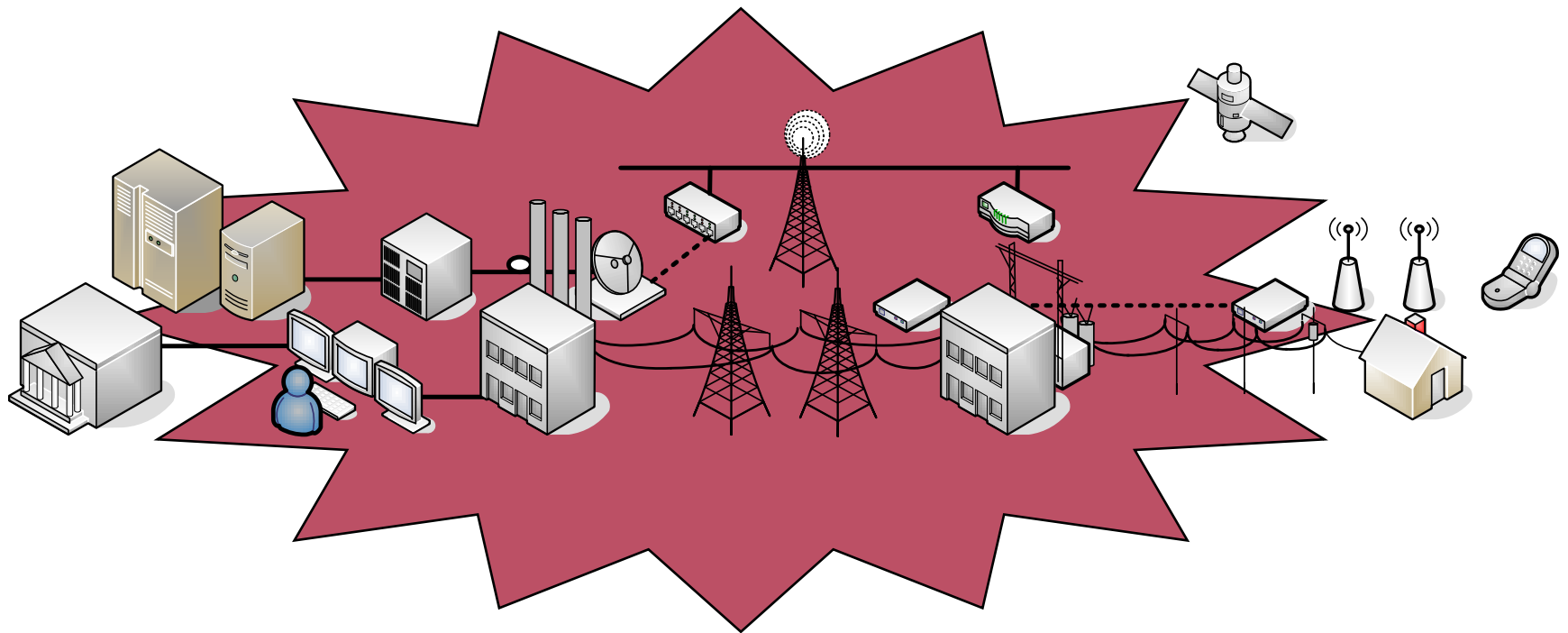


Electrical Infrastructure

“Intelligence” Infrastructure



The Smart Grid



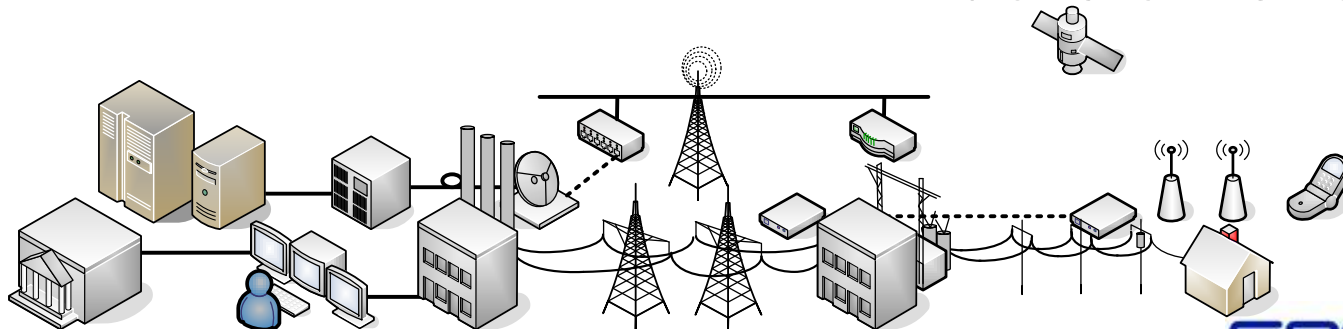
Smart Grid Applications drive the Infrastructure Requirements

Today's Applications

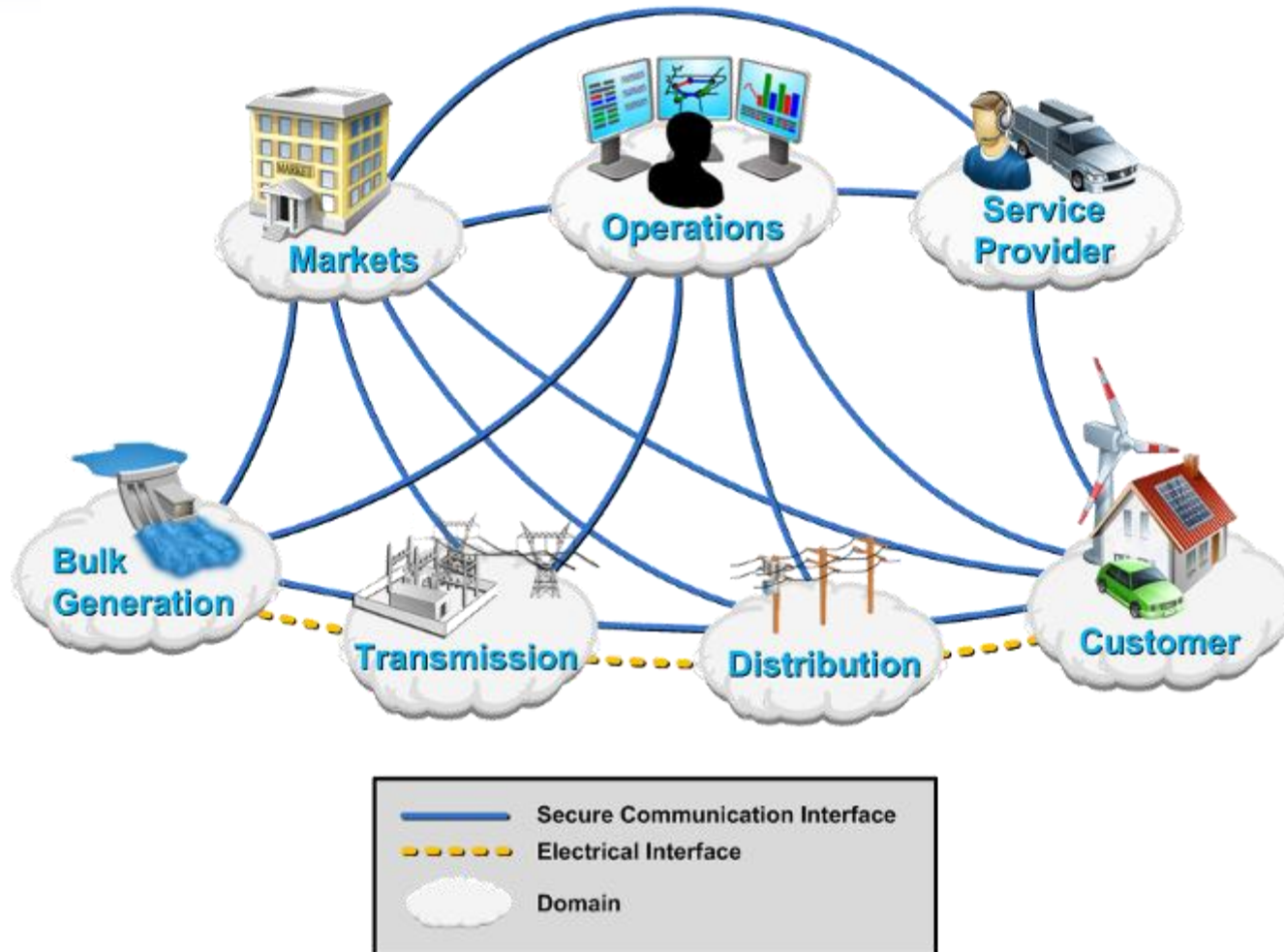
- **Transmission Applications**
 - Synchrophasor application
- **Distribution Applications**
 - Integrated voltage/var management
- **Consumer Applications**
 - Feedback and dynamic pricing

Tomorrow's Applications

- **Transmission Applications**
 - Automated condition assessment
- **Distribution Applications**
 - Integrating distributed resources and PHEV
- **Consumer Applications**
 - Prices to Devices and Home Automation Networks



Challenge in Deploying Smart Grid: Integrating Information Between Domains



Foundation of Smart Grid

Security

Information Management

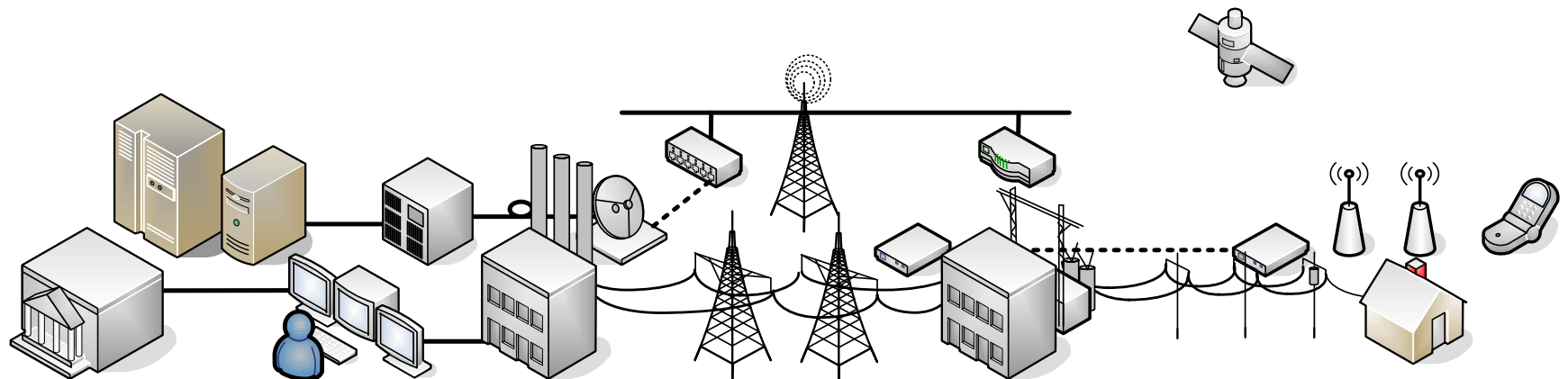
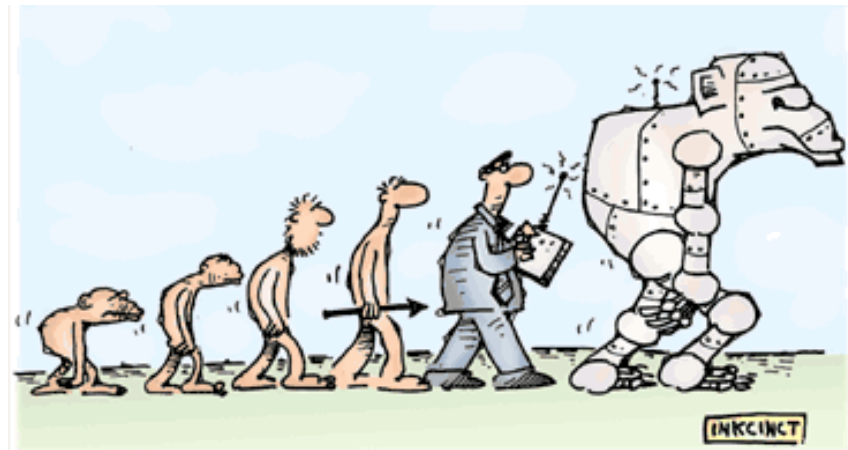
Communications

Interoperability

Systems Engineering Methodology

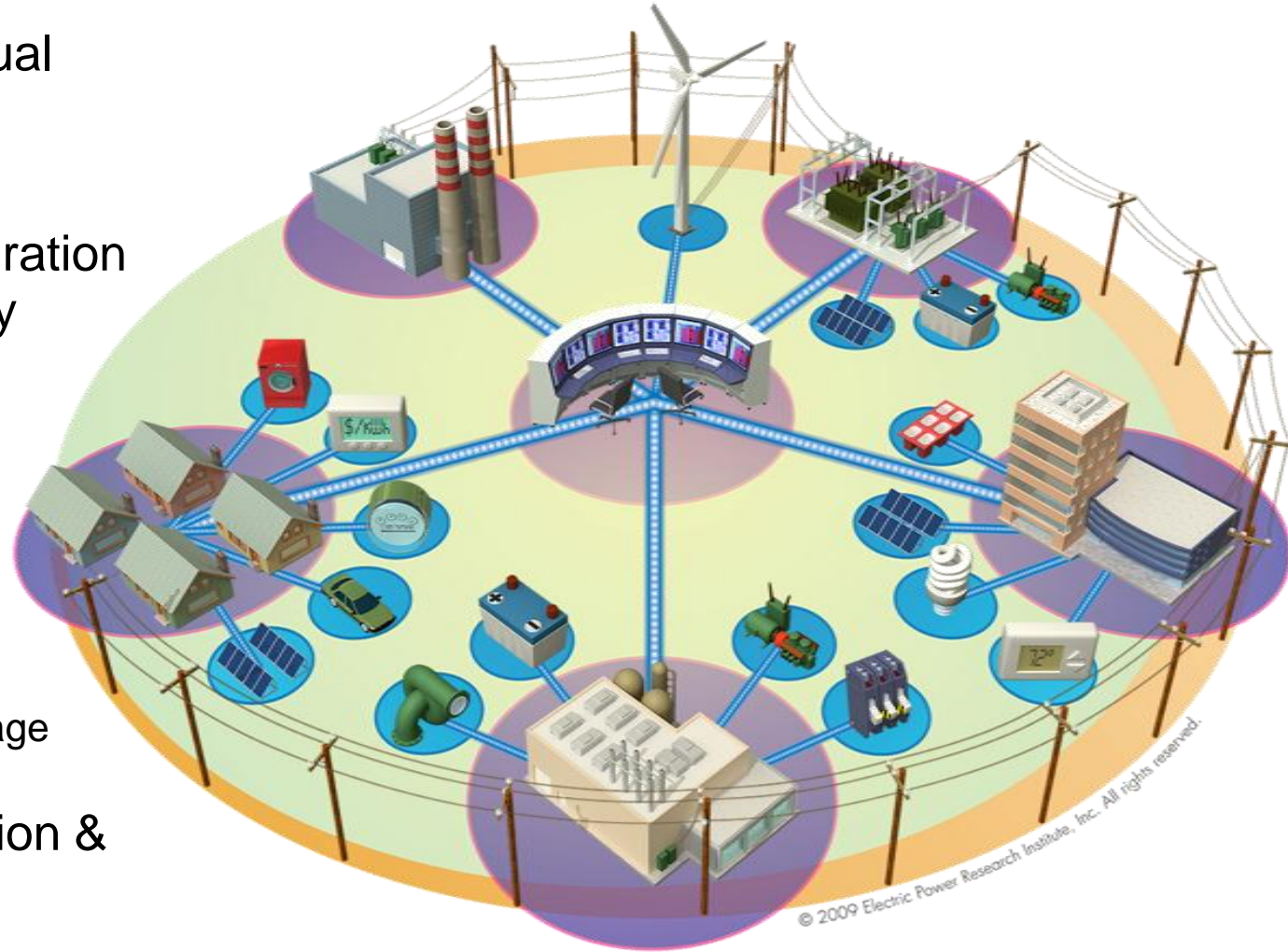
How is the Smart Grid Created?

The smart grid is not created all at once – it will evolve over many years from today's infrastructure through the deployment and integration of *Intelligent Systems*



EPRI Smart Grid Demonstrations

- Deploying the Virtual Power Plant
- Demonstrate Integration and Interoperability
- Several regional demonstrations
 - Multiple Levels of Integration
 - Multiple Types of Distributed Energy Resources & Storage
- Leverage information & Communication Technologies



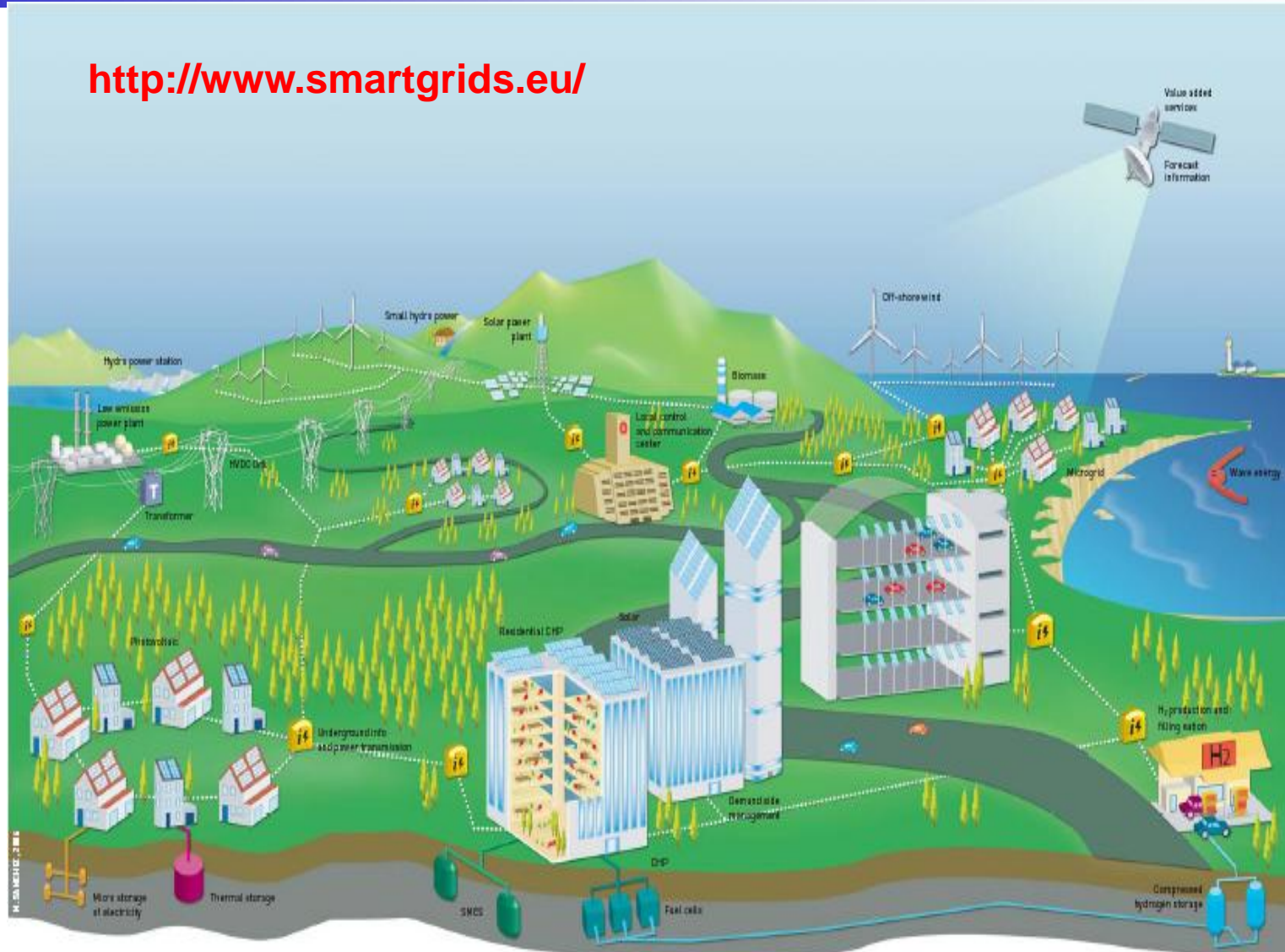
DOE Distribution Integration Awards



- Allegheny Power, WVU, NC State, Research & Development Solutions, Augusta Systems, Tollgrade – **West Virginia Super Circuit**
- ATK Launch Systems, Rocky Mountain Power, P&E Automation – **integration of renewables, DG, and storage (compressed air).**
- Chevron Energy Solutions, Alameda County, PG&E, VRN Power Systems, SatCon, Univ of Wisc., NREL, LBNL, E3 – **Solar, fuel cell and storage microgrid.**
- City of Fort Collins, Colorado State Univ, InteGrid Lab, Comm Found of Northern Col, Governor's Energy Office, Advanced Energy, Woodward Spiraе, Eaton – **3.5 MW mixed distributed resources for peak load reduction.**
- IIT, Exelon/ComEd, Galvin Electricity, S&C – **“perfect Power” demonstration**
- Con Edison, Verizon, Innovative power, Infotility, Enernex – **Interoperability between utility and end use customers for DG aggregation.**
- SDG&E, Horizon Energy Group, Advanced Control Systems, PNNL, Univ of San Diego, Motorola, Lockheed Martin – **Integrating multiple distributed resources with advanced controls.**
- Univ of Hawaii, GE, HECO, MECO, Columbus Electric Coop, NM Inst of Mining and Tech, Sentech, UPC Wind – **Mgt of distributed resources for improved quality and reliability, grid support, and transmission relief.**
- Univ of Nevada, Pulte Homes, Nevada Power, GE Ecomagination – **Integrated PV, battery storage, and consumer products with advanced metering.**

Numerous European and other international demonstrations and deployments

<http://www.smartgrids.eu/>



Smart Grid Resource Center

This site serves as a home for information about EPRI Smart Grid research, demonstration projects, and the Smart Grid Use Case Repository.

Smart Grid

A Smart Grid is one that incorporates information and communications technology into every aspect of electricity generation, delivery and consumption in order to:

- minimize environmental impact;
- enhance markets,
- improve reliability and service,
- reduce costs and improve efficiency.

Smart Grid Use Case Repository

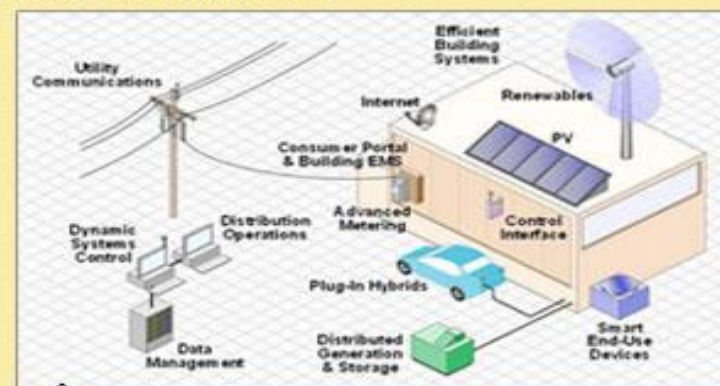
The Use Case Repository is a public resource for the electric power industry to house Smart Grid related use cases as well as provide a forum for the industry to contribute to this effort by submitting their own use cases.

- [Use Case Repository](#)

Smart Grid Training Hub

- Dec

Smart Grid Network



Mouseover Image for larger view



Smart Grid Network

Smart Grid News

Current

Archive

[Energy Central features an Intelligrid report by EPRI's Don Von Dollen](#) – Month, Day, 200X

[EPRI's Green Grid report featured on Carbon Offsets Daily](#) – Month, Day, 200X

[M2M Radio discusses Smart Grid with EPRI's](#)

EPRI Smart Grid Resource Center launched: www.smartgrid.epri.com