

# “SMART GRID”

-Do We Really Understand-



**SMART GRID** - “A comprehensive system developed to use the technical innovations of the digital age to maximize the efficient generation, transmission, distribution and use of electrical energy.”

In creating this identity, we examined a web of complex ideas, technology, applications, and practices and organized them to a few simple terms.

- **Devices** with smart technology (meters, sensors, protection gear, storage, computing, load control, generation sources, etc...)
- **Two-way communications** (broadband, fiber, wireless, SCADA, GIS, security, etc...)
- **Regulatory Issues** (Purchased Power agreements, Demand Response, Time Of Use Tariffs, Transmission & Distribution management, etc...)

# AGENDA

1. Overview
2. Functions & Features
3. Common Terms
4. Devices
5. Communications
6. Regulatory
7. Next Steps
8. Questions & Answers

## What Others are Saying

**Burns & McDonnell** – The smart grid is the convergence of information and operational technology applied to the electric grid, allowing sustainable options to customers and improved security, reliability and efficiency to utilities.

**Trilliant Inc.** – The smart grid is a collection of energy control and monitoring devices, software, networking and communications infrastructure that are installed in homes, businesses, and throughout the electricity distribution grid. This collective system provides a “nervous system” for the grid and for customers that provides the ability to monitor and control energy consumption comprehensively in real time. Think of it as the Internet for Energy.

**Xcel Energy** – While details vary greatly, the general definition of a smart grid is an intelligent, auto-balancing, self-monitoring power grid that accepts any source of fuel and transforms it into a consumer’s end use with minimal human intervention. It is a system that will all society to optimize the use of renewable energy sources and minimize our collective environmental footprint. It is a grid that has the ability to sense when a part of its system is overloaded and reroute power to reduce that overload and prevent a potential outage situation; a grid that enables real-time communications between the consumer’s energy usage based on environmental and/or price preferences.



# What the U.S. Department of Energy (DOE) is Saying?

## Title XIII of the Energy Independence and Security Act of 2007 (EISA)

It is the policy of the United States to support the modernization of the Nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth and to achieve each of the following, which together characterize a Smart Grid:

1. Increased use of digital information and controls technology to improve reliability, security, and efficiency of the electric grid.
2. Dynamic optimization of grid operations and resources, with full cyber-security.
3. Deployment and integration of distributed resources and generation, including renewable resources.
4. Development and incorporation of demand response, demand-side resources, and energy-efficiency resources.
5. Deployment of `smart' technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for metering, communications concerning grid operations and status, and distribution automation.
6. Integration of `smart' appliances and consumer devices.
7. Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning.
8. Provision to consumers of timely information and control options.
9. Development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.
10. Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.



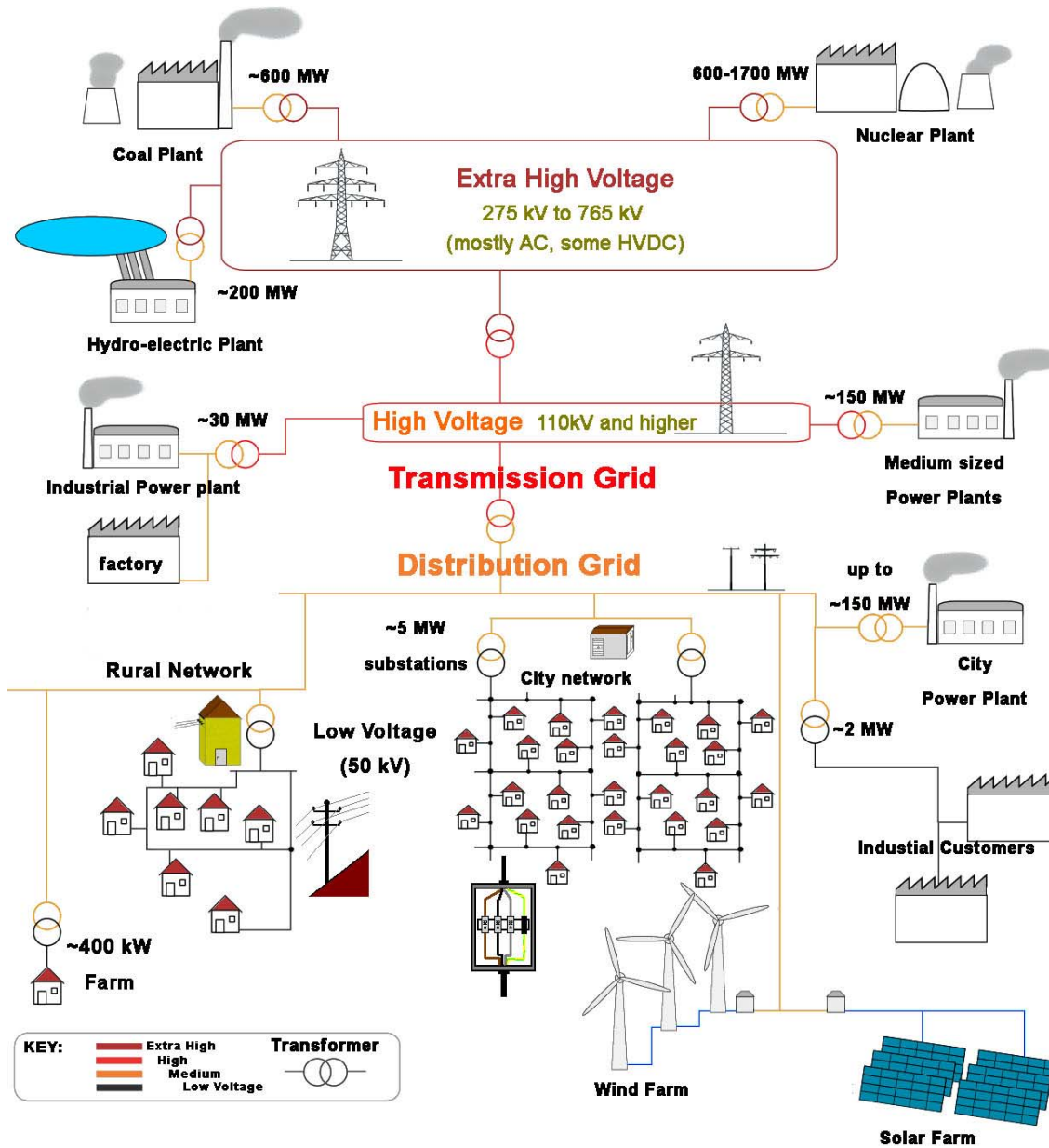
# APPA Public Power in the 21<sup>st</sup> Century

## “It’s Your Future...Lead It!”

These 10 recommendations offer sound approaches to the policy direction and management of public power utilities that should be beneficial regardless of the future direction of the electric utility industry.

1. **Provide superior customer service**
2. **Deliver value through power supply management.**
3. **Focus on distribution performance and opportunity.**
4. **Keep the public in public power.**
5. **Optimize community infrastructure.**
6. **Lead in environmental stewardship.**
7. **Build consensus through democratic governance.**
8. **Promote human resource excellence.**
9. **Engage policymakers through legislative advocacy.**
10. **Invest in your technology future.**





# Common Terms

- **Advanced Meter Infrastructure (AMI)** – A system that measure, collect and analyze energy usage, from advanced devices, through various communication media.
- **Automatic Meter Reading (AMR)** – The technology of automatically collecting data from an advanced device and transferring that data to a central database for billing and/or analyzing.
- **Demand Response (DR)** – Managing customer consumption in response to supply conditions.
- **Demand-side Management (DSM)** – Actions that influence the quantity or patterns of use of energy consumed by end users.
- **Distributed Generation (DG)** – Generation of electricity from many small energy sources.
- **Distribution Automation (DA)** – The extension of intelligent (digital) control over electrical power grid functions to the distribution level and beyond.

# Common Terms

- **Energy Management Systems (EMS)** – A system of computer-aided tools used by utilities to monitor, control, and optimize the performance of the generation and transmission systems.
- **Home Area Networks (HAN)** – A group of interconnected “smart” devices and/or appliances at the consumer level
- **Micro-grids (MG)** – Aggregating and interconnecting small groups of consumers and generation on a local grid.
- **Remote Equipment Monitoring** – Software modules that support local, remote, and very remote monitoring and control of a variety of equipment over a variety of communications links.
- **Smart Meter** – An advanced meter that identifies consumption in more detail than a conventional meter, capable of communicating that information back to the utility for billing and analysis purposes.

# Devices

- **Devices** with smart technology (meters, sensors, protection gear, storage, computing, load control, generation sources, etc...)

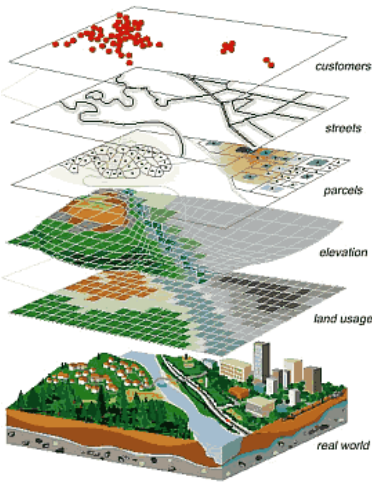
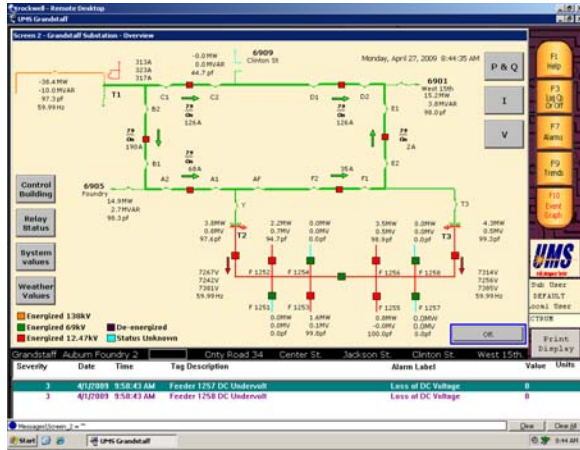


Xcel Energy Wind-to-Battery installation  
Inset at right shows S&C Smart Grid  
Storage Management System



# Communications

- **Two-way communications** (broadband, fiber, wireless, SCADA, GIS, security, etc...)



# Regulatory

- **Regulatory Issues** (Purchased Power agreements, Demand Response, Time Of Use Tariffs, Transmission & Distribution management, etc...)

Engineering Partnerships

FERC

NERC

Time of Use

NIST

EISA 2007

Cap & Trade??

Demand Response



**Spectrum**  
ENGINEERING CORPORATION

# Next Steps

- **Engineering Partnerships – Review and establish forward looking planning based on the following services:**

- Advanced Metering Infrastructure
- Automatic Meter Reading
- Business Analysis
- Data Acquisition Technologies
- Data Analytics & Evaluation
- Data Integration Management
- Data Storage & Analysis
- Demand Response
- Demand Side Management
- Energy Management Systems
- Energy Services
- Grid monitoring & Control Applications
- Home Area Networks
- Micro-grids
- NERC Compliance
- Off-peak Energy Storage
- Program Management
- Remote Equipment Monitoring
- Security
- Renewable Energy (Solar/Wind/Fuel Cells)
- Substation Automation Networks
- SCADA
- Telecommunications



# Useful Links

- **DOE** – Office of Electricity Delivery & Energy Reliability (OE)  
<http://www.oe.energy.gov/smartgrid.htm>
- **GridWise Architecture Council (GWAC)** - The GridWise® Architecture Council (GWAC) was formed by the U.S. Department of Energy to promote and enable interoperability among the many entities that interact with the nation's electric power system.  
<http://www.gridwiseac.org/>
- **NIST** – <http://www.nist.gov/smartgrid/>
- **Smart Grid News** –  
<http://www.smartgridnews.com/artman/publish/index.html>
- **Spectrum Engineering** - For over thirty years Spectrum has been dedicated to anticipating needs, solving problems and working closely with our clients. We stand behind our reputation as a knowledgeable, dependable and resourceful partner, focused on helping our clients achieve their objectives. <http://www.spectrumeng.com/>



# Questions & Answers

