

Safety Analysis Of Smart Grid

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Presentation Outline

- What is Smart Grid
- Smart Grid Motivations
- How is Smart Grid different from conventional grid system
- Safety of Smart Grid

What Is Smart Grid

- Smart Grid entails the combination of **hardware, management and reporting software**, built atop an **intelligent communications** infrastructure.
- In the world of the Smart Grid, **consumers and utility companies** alike have **tools to manage, monitor and respond to energy issues**.
- The flow of electricity from **utility to consumer** becomes a **two-way conversation**, **saving consumers money, energy**, delivering more **transparency** in terms of end-user use, and reducing carbon emissions.

What Is Smart Grid

- ❑ **The Smart Grid in general, sits at the intersection of Energy, IT and Telecommunication Technologies.**

Smart Grid

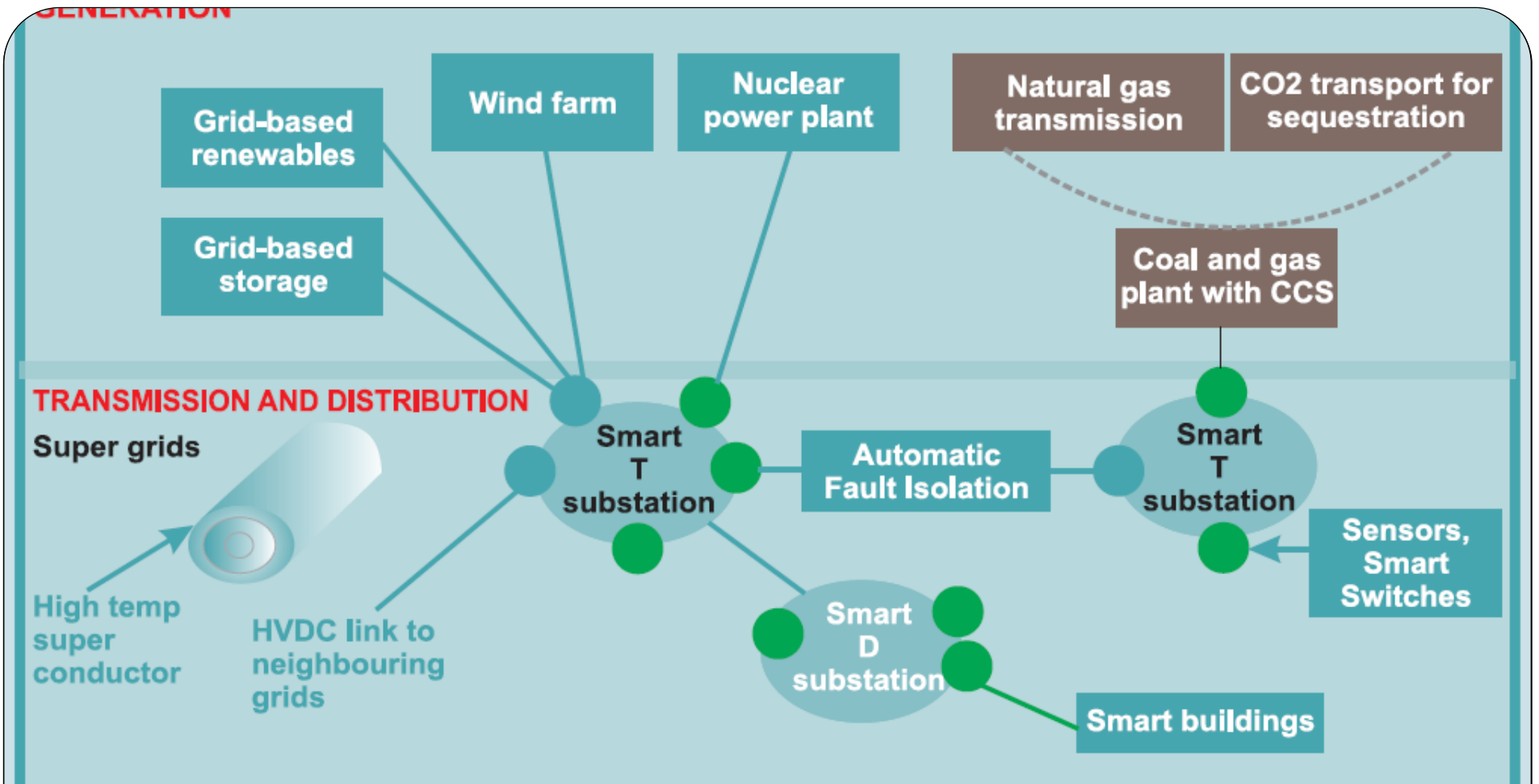
□ A smart grid puts information and communication technology into electricity generation, delivery, and consumption, making systems cleaner, safer, and more reliable and efficient.

U.S. Department of Energy Definition:

A smart grid integrates advanced sensing technologies, control methods, and integrated communications into the current electricity grid.

Smart Grid Motivation

- ❖ Transmission and Distribution Optimization
- ❖ Demand Side Management
- ❖ Integrate isolated technologies : Smart Grid enables better energy management.
- ❖ Proactive management of electrical network during emergency situations.
- ❖ Better demand supply / demand response management.
- ❖ Better power quality
- ❖ Reduce carbon emissions.
- ❖ Increasing demand for energy : requires more complex and critical solution with better energy management



Smart Grid Overview

Transmission & Distribution Optimization

- ❑ Need for development of Smart Grid having features like-
 - Phasor Measurement Technique
 - Wide Area Measurement (WAM)
 - Flexible AC Transmission System (FACTS)
 - Adoptive Islanding
 - Self healing Grids
 - Probabilistic and Dynamic Stability Assessment
 - Distributed and autonomous Control

Transmission & Distribution Optimization

- Distribution Automation
- Demand Optimization - Selective Load Control
- Operation –Islanding of Micro-grids
- Managing Distribution Network Model
- Outage management and AMI Integration

- DMS & Advanced Switching Applications

- Integrated Voltage / VAR Control

Demand Optimization

- Demand Response – Smart Metering:
 - Automatic, Real Time, Consumer Communication & Load Control

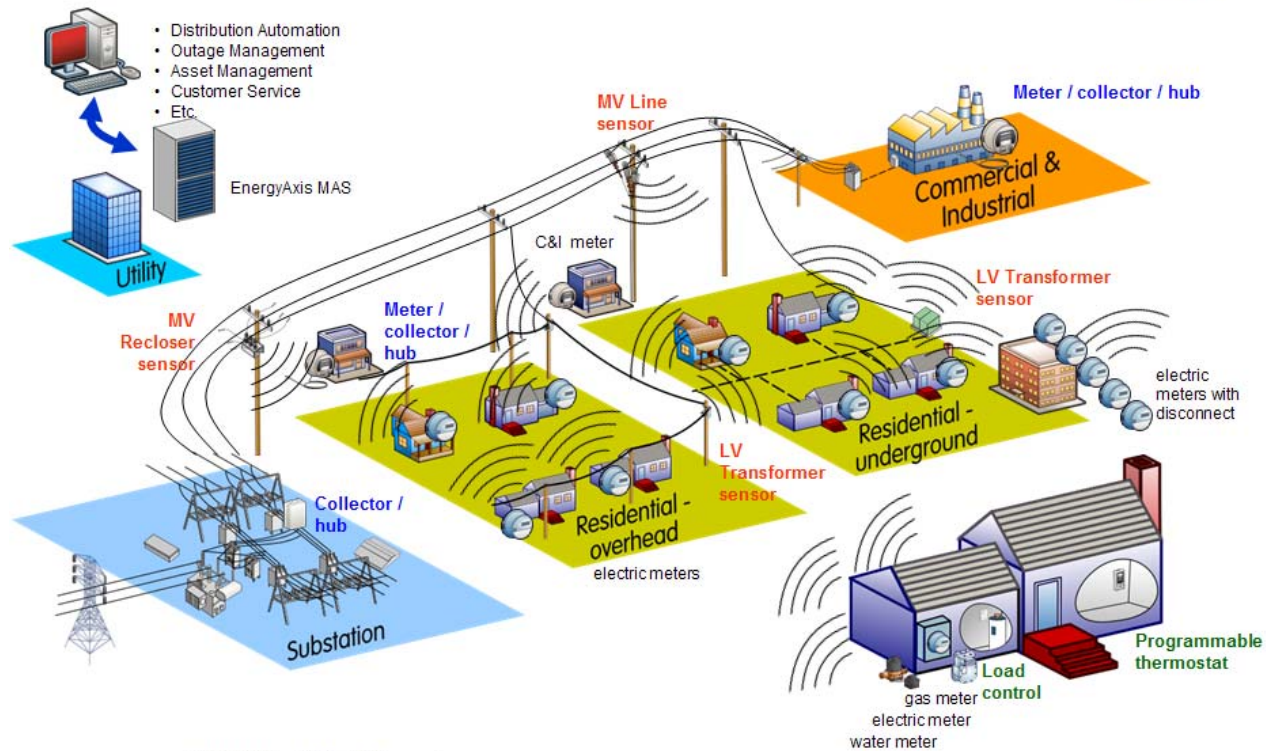
- Demand Response – Consumer

- Demand Response Management System

- In Home Technology enabling

Safety Of Smart Grid

Elster AMI System for the Smart Grid



Safety of Smart Grid

❑ Classification of Smart Grid Safety Issues:

- Public Privacy
- Health Issues –Accumulated RF
- Data Safety –Network Vulnerability
- Meter Failure – Billing Issues

Safety of Smart Grid

❖ **Public Privacy:**

- EPIC Public Privacy concerns to Public Utility Commission on Smart Grid filing in Dec 18, 2008
- Rule made in Dec 8, 2009

Safety of Smart Grid

❖ **Public Privacy Concerns:**

- Personally Identifiable Information (PII) –open ended
- collection, retention, sharing, or reuse of electricity consumption information on individuals, homes, or offices.
- collect, retain, use, or share PII
- multi-- directional communication and energy transfer networks that enable electricity service providers, consumers, or third– party access to customer information.

Safety of Smart Grid

❖ **Public Private Concern:**

- Recently, the Supreme Court in *Kyllo v. United States* addressed the privacy implications of the monitoring of electricity use in the home. After reviewing precedent, the Court found that a search warrant must be obtained before the government may use new technology to monitor the use of devices that generate heat in the home

Safety of Smart Grid

❖ Health Implication:

- Smart metering will turn every single appliance into the *equivalent of a transmitting cell phone*,
- Exposure to radiofrequency radiation (RF) of wireless technologies is an increasing health risk.
- Every dishwasher, microwave oven, stove, washing machine, clothes dryer, air conditioner, furnace, refrigerator, freezer, coffee maker, TV, computer, printer, and fax machine will be equipped with transmitting antenna.

Safety of Smart Grid

❖ Health Implication:

- Citing of “electricity theft” could make it illegal to deactivate the wireless component without disabling it and voiding warranties for people who don’t want to use such appliances
- Wireless data will be transmitted at peak power bursts far above current safety standards
- Frequencies between 917 MHz and 3.65 GHz in the ultra-high frequency/microwave ranges of the electromagnetic spectrum, several times a minute.
- Exposure to the accumulated RF of possibly 100-to-500 of your neighbors’ meters -- a hefty barrage of radiation.

Safety of Smart Grid

❖ Health Implication:

- Study found cancer in animals, birds, affect reproductive system, lower milk production, immune system disorder
- Research on RF and human health dates to the 1940s when World War II's radar revealed infertility and cataracts in military personnel.
- Fifteen studies report effects among people living 50-to-1500 feet from a cell tower -- including cancers, immune system effects, fertility problems, miscarriages, sleeplessness, dizziness, concentration

Safety of smart Grid

❖ Data Security:

- Terrorists can remotely manipulate and cripple national power system
- Identity theft threat
- In April 2009, *The Wall Street Journal* reported that cyber spies had infiltrated the U.S. electric grid and left behind software that could be used to disrupt the system.
- The system could be vulnerable to network spoof and denial of service attacks
- In October 2006, a foreign hacker invaded the Harrisburg, Pa., water filtration system and planted malware.

Safety of Smart Grid

❖ **Meter failure:**

- Smart systems can wreak havoc with electronics
- In New Zealand firefighters report 422 fires in 2010 involved with smart meters
- People are complaining of ceiling fans turning on in the middle of the night, speeds spontaneously changing, paddles reversing direction, and circuit boards burning up.
- A few meters have exploded. Others have fried electronics.

Comments



Questions !!