

Smart Grid:

Testing and certification needs for components in the supply chain

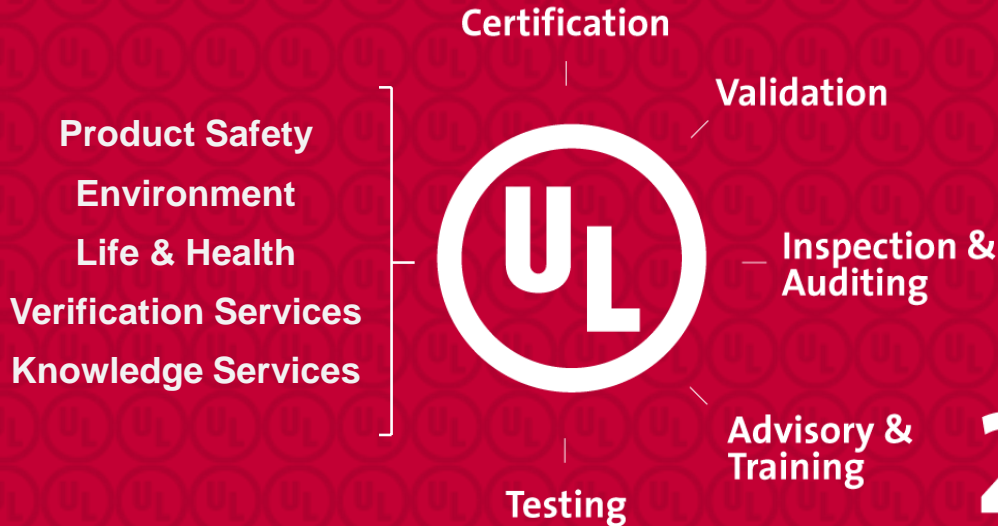
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June 27, 2012



UL's Mission:

Lead the world in creating safe living and working environments that meet the evolving needs of people.



23 BILLION UL MARKS APPEAR ON PRODUCTS ANNUALLY

2 BILLION CONSUMERS WERE REACHED BY UL IN ASIA, EUROPE AND NORTH AMERICA

MORE THAN **500K** FOLLOW-UP INSPECTION VISITS WERE CONDUCTED BY UL

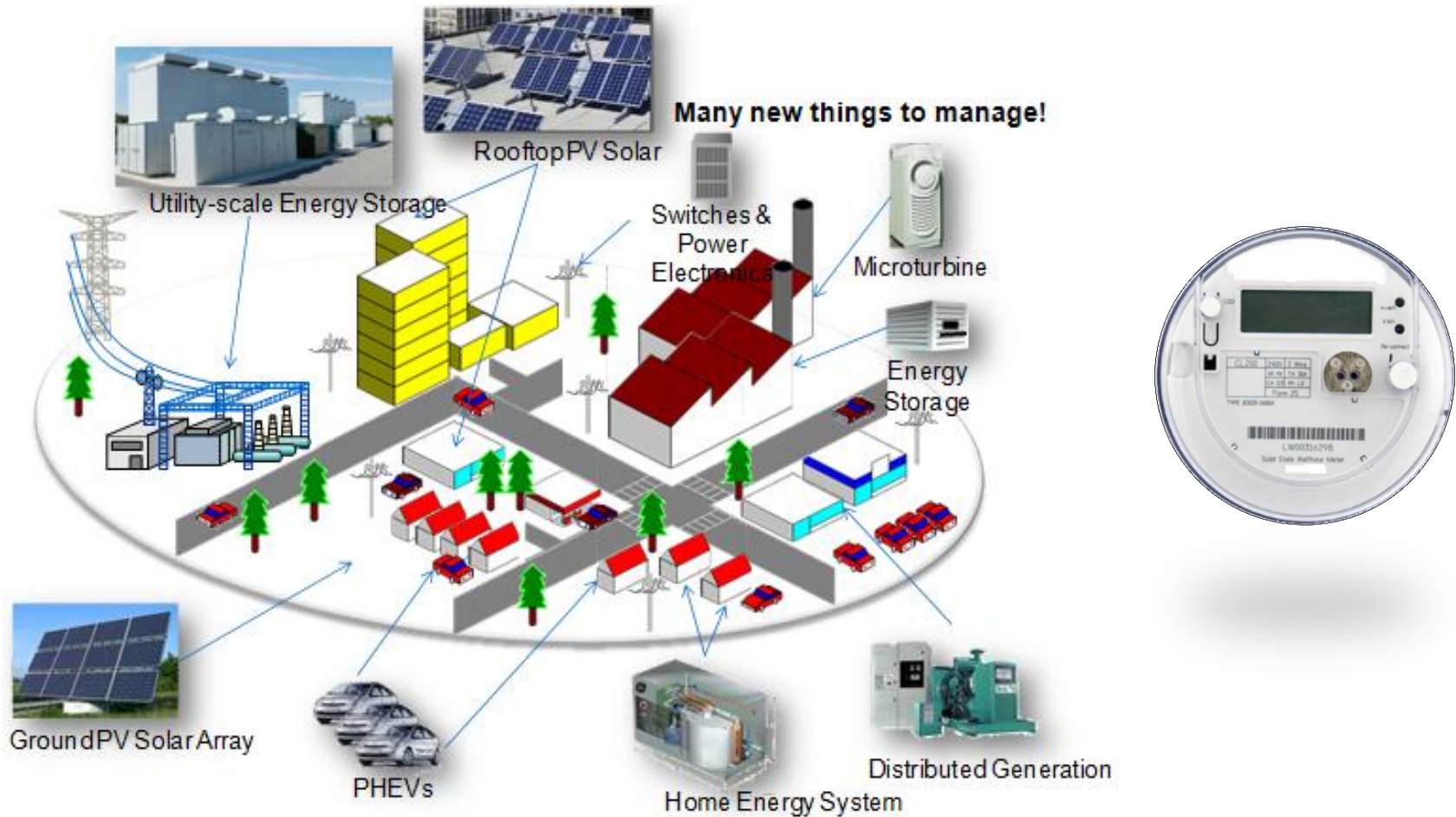
19,722 TYPES OF PRODUCTS EVALUATED BY UL

1,413 CURRENT STANDARDS FOR SAFETY PUBLISHED BY UL

88,189 PRODUCT EVALUATIONS CONDUCTED BY UL

160,881 NUMBER OF ACTIVE FILES

Traditional lines of demarcation between utilities and consumers have begun to blur



What are the main concerns, for both utilities and consumers, with regards to 'smart products'?

Safety

Is the product going to start a fire?



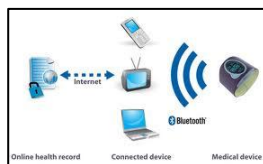
Wireless

Does it connect?



Interoperability

Can it work with others?



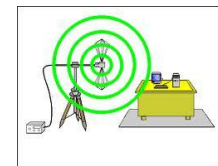
Cyber Security

Can it be hacked?



Radio Frequency

Are there interference risks?



Data Privacy

Is the data collected private?



- Manufacturers have to keep up with a variety of emerging requirements for interoperability and device performance
- Utilities struggle with evolving cyber-threats, policy legislation, and standards
- Utilities need performance and reliability studies to maximize large scale deployment success

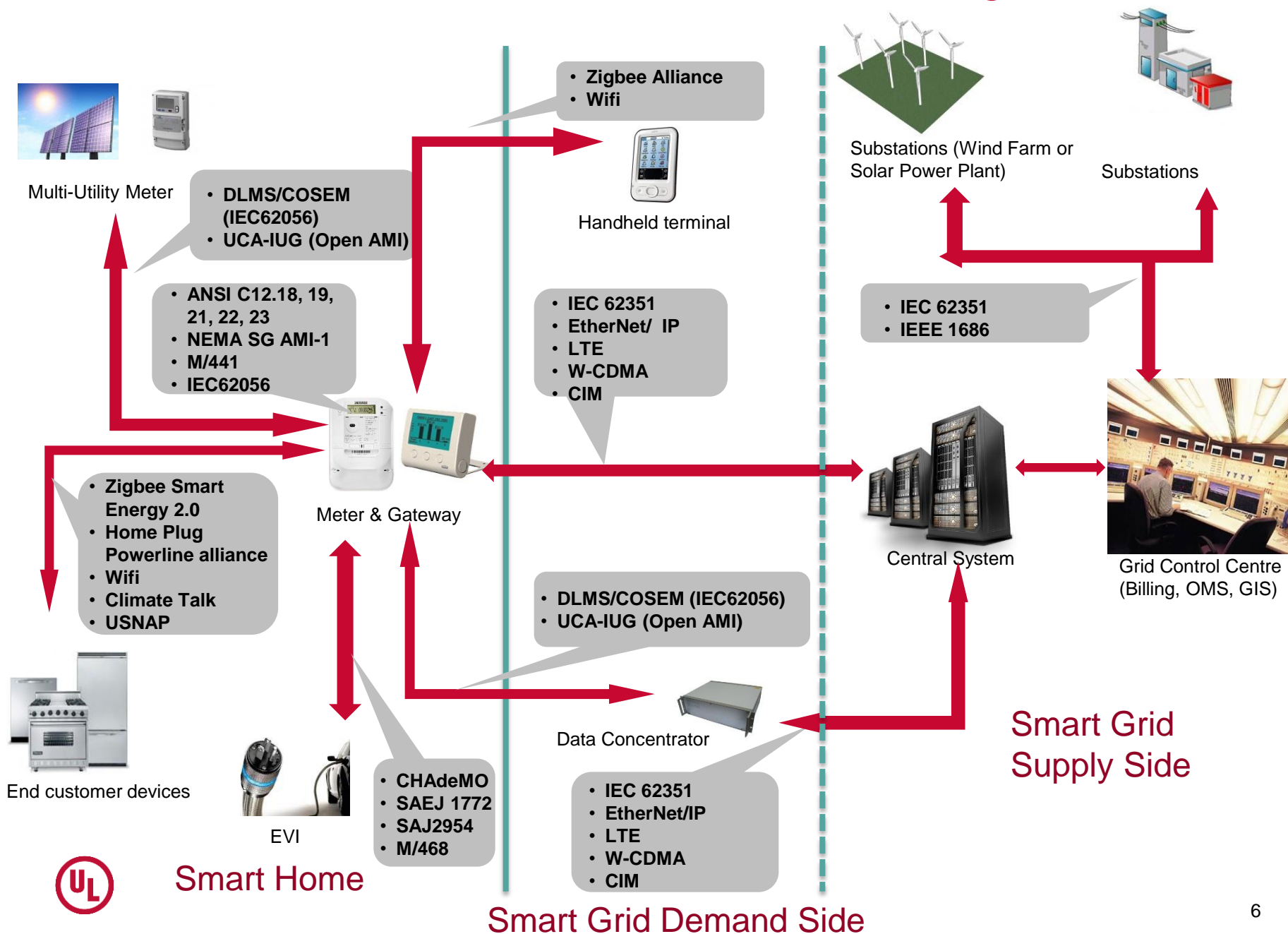
Example: Smart Products, Applicable Certifications

| Water Heater | Electric Vehicle | PV Inverter | HEMS | Smart Meter | Certification Attribute | Comments |
|--------------|------------------|-------------|------|-------------|--------------------------------|---|
| X | X | X | X | X | Safety ¹ | product is safe under conditions of normal and reasonably foreseeable abnormal conditions |
| X | X | X | X | X | Wireless | product properly dialogues with the communications infrastructure |
| X | X | X | X | X | Electro Magnetic Compatibility | Product does not emit disturbing noise onto other equipment, and is resilient to external interferences |
| X | X | X | X | X | Interoperable | product properly communicates and reacts with other products; communication protocols meet specified requirements |
| ? | X | X | X | X | Secure | product is hardened against outside attacks, closes doors |
| ? | X | ? | X | X | Private | access to and use of data is controlled |



Note 1: includes considerations to software functions (i.e. functional safety)

Common Communication Protocols Used Throughout the Grid



Smart Home

Smart Grid Demand Side

Smart Grid Supply Side

Cyber Security Industry Standards

- IEC 62443-2-1 - Industrial communication networks - Network and system security
- BSR/IEEE C37.240-201 - Standard for Cyber Security Requirements for Substation Automation, Protection and Control Systems
- ANSI/ISA-99.00.01 - Security for Industrial Automation and Control Systems
- IEC 62351 - Information Security for Power System Control Operations
- AMI System Security Requirements
- NIST SP 800-82 - Guide to Industrial Control Systems (ICS) Security
- SP 800-53 Recommended Security Controls for Federal Information Systems (including those for the Bulk Power System)
- IEEE 1686-2007 - Standard for Substation Intelligent Electronic Devices (IEDs) Cyber Security Capabilities
- NERC CIP (Critical Infrastructure Protection) 002-009 - Cyber Security Standards for the Bulk Power System



Subject 2744: Safety of Products in Smart Environments

- **Scope**
 - Products intended to interact with the Smart Grid, generally known as “Smart Products,” which includes “Smart Appliances”
- **Base Requirements**
 - Environmental Noise
 - EMI / EMC (Emissions, Immunity)
 - Functional Safety
 - IEC 61508
 - Tamper Detection
 - Networked product subject to unauthorized access



Questions