

A Smarter Power Grid

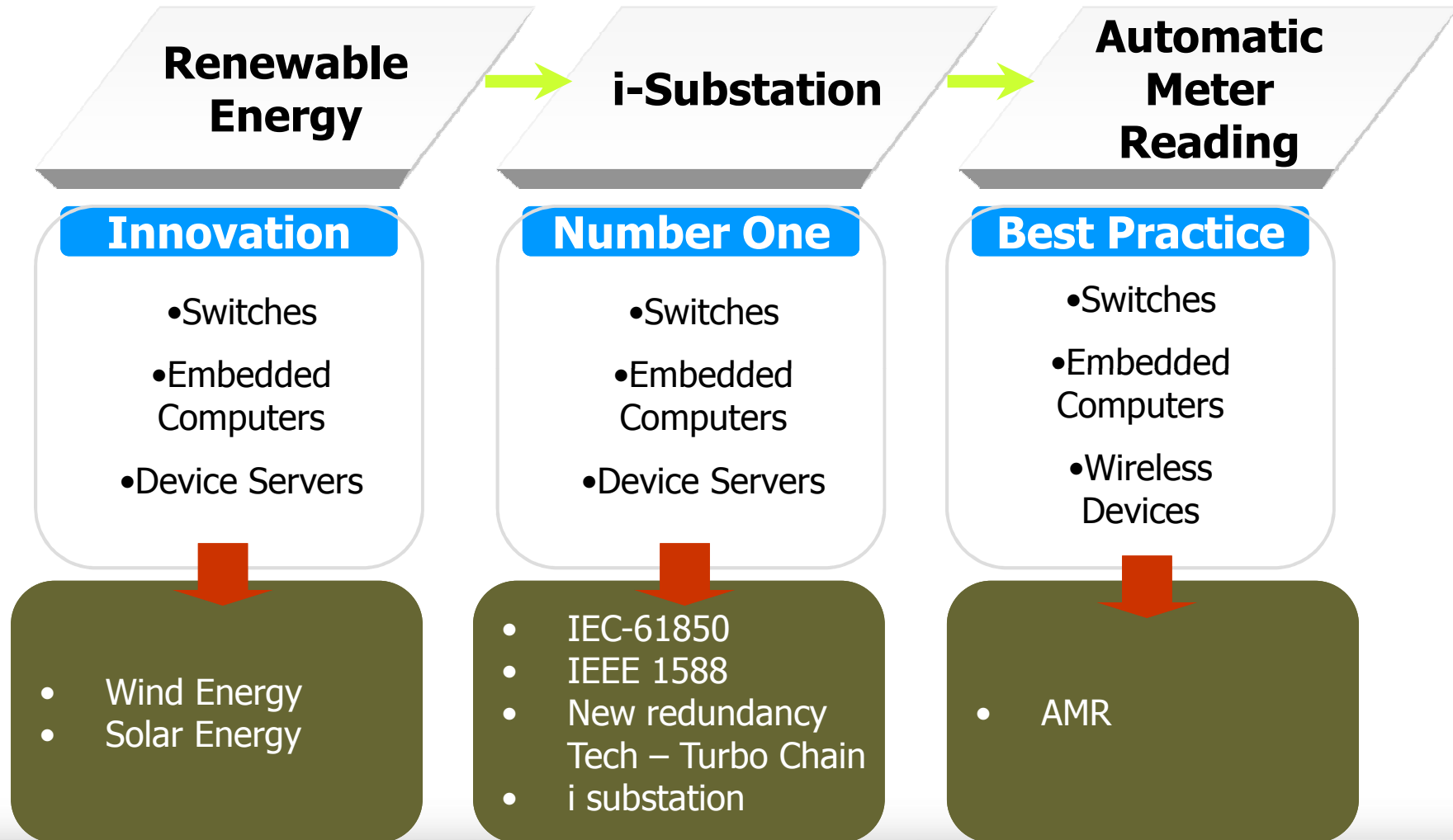
Prepared by:

Edward Lu / Business Development Manager

MOXA[®]

SOLUTION DAY

Moxa's **Complete** Solution to Create a **Smarter** Grid



Agenda

- Overview
- Structure
- Successful Applications
- Why Moxa?

Agenda

- **Overview**

- Structure

- Successful Applications

- Why Moxa?

A Smart Grid is an Optimized Grid

Current Power Grid Problem

- *Today's electricity system is reported to be 99.97 percent reliable, yet power outages and interruptions cost Americans at least \$150 billion each year — about \$500 for every man, woman, and child.*
- *Even with 99.97 percent uptime, inefficiencies in the power transmission process means that as much as 67% of the energy is lost before it reaches the users.*

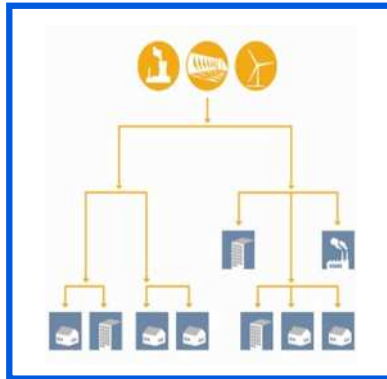
What is Smart Grid?

- “a smart grid is an **electricity delivery system** (from **point of generation** to **point of consumption**) integrated with communications and information technology”
- “an **automated**, widely **distributed** energy delivery **network** characterized by a **two-way flow** of electricity and information that is capable of **monitoring and responding** to changes in everything, from power plants to customer preferences to individual appliances.”

~Definition Resources: U.S Department of Energy

From “Traditional” to “Smart” Grid

traditional grid



- Centralized power generation
- One-directional power flow
- Generation follows load
- Top-down operations planning
- Operation based on historical experience

smart grids



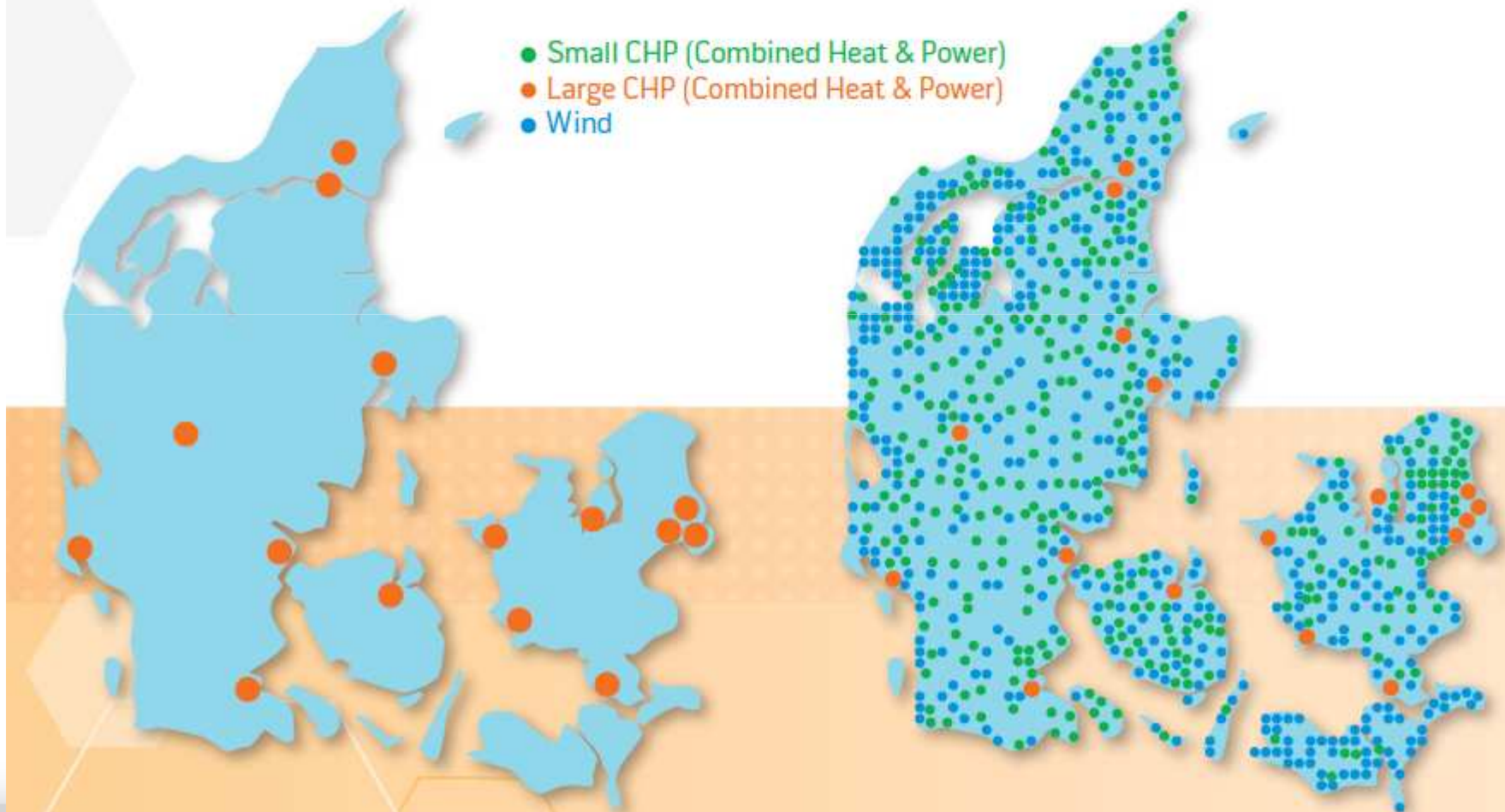
- Centralized and distributed power generation
- Intermittent renewable power generation
- Multi-directional power flow
- Consumption integrated in system operation
- Operation based on real-time data

ABB

MOXA[®]

New Distributed System

DENMARK'S PROGRESS OVER THE PAST TWO DECADES



The Benefits of Smart Grid

- To get the most out of the existing electricity infrastructure and reroute investments to new generation, transmission, and distributing facilities
- To reduce the overall costs of delivering power to end users, emissions of CO2 and other pollutants
- To improve the reliability of power delivery to end users

The Tasks and Challenges of Smart Grids

- Integrate distributed renewable energy for power generation
- Digitize the aging power electricity infrastructure
- Create a monitoring system for balancing electricity supply and demand

Forecasts and Predictions

- By 2010, the global Smart Grid market value is **USD 20 Billion**; by 2013, it will reach **USD 100 Billion**
- Copenhagen Climate Change Conference: a **20-40% carbon emissions reduction** by industrial countries by 2020
- EnerNOC stock price from **USD 7 to USD 35.5**



■ **Meters Manufacturers**

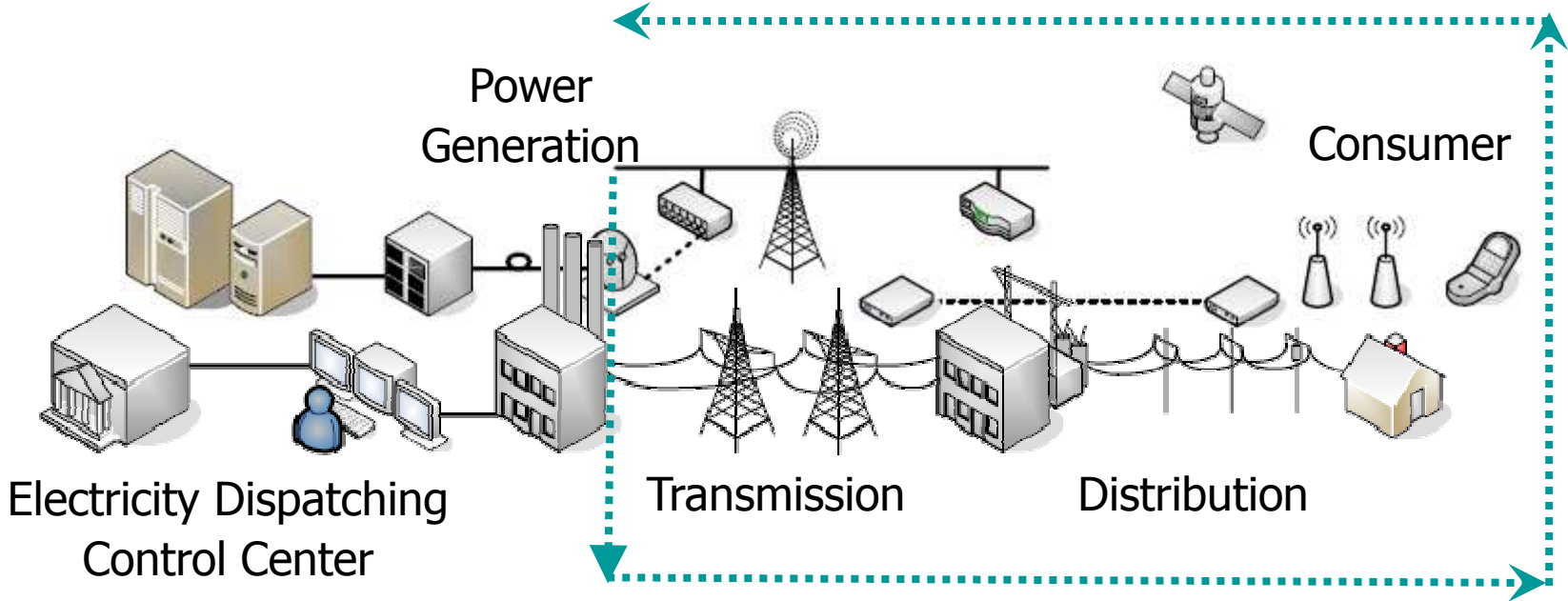
■ **Heavy Electrical
Equipment**

■ **Energy/Power Companies**

Agenda

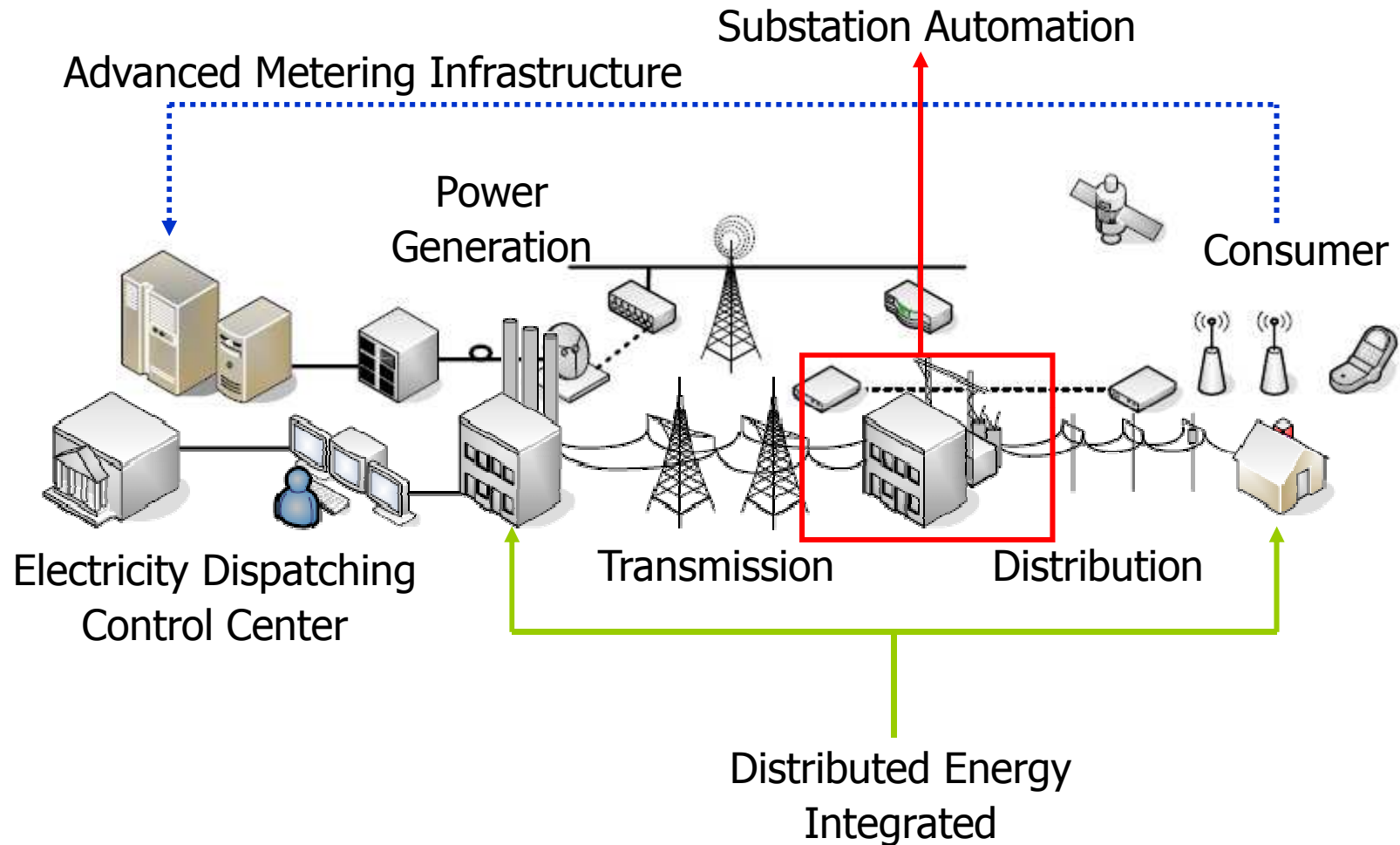
- Overview
- **Structure**
- Successful Applications
- Why Moxa?

Smart Grid Infrastructure

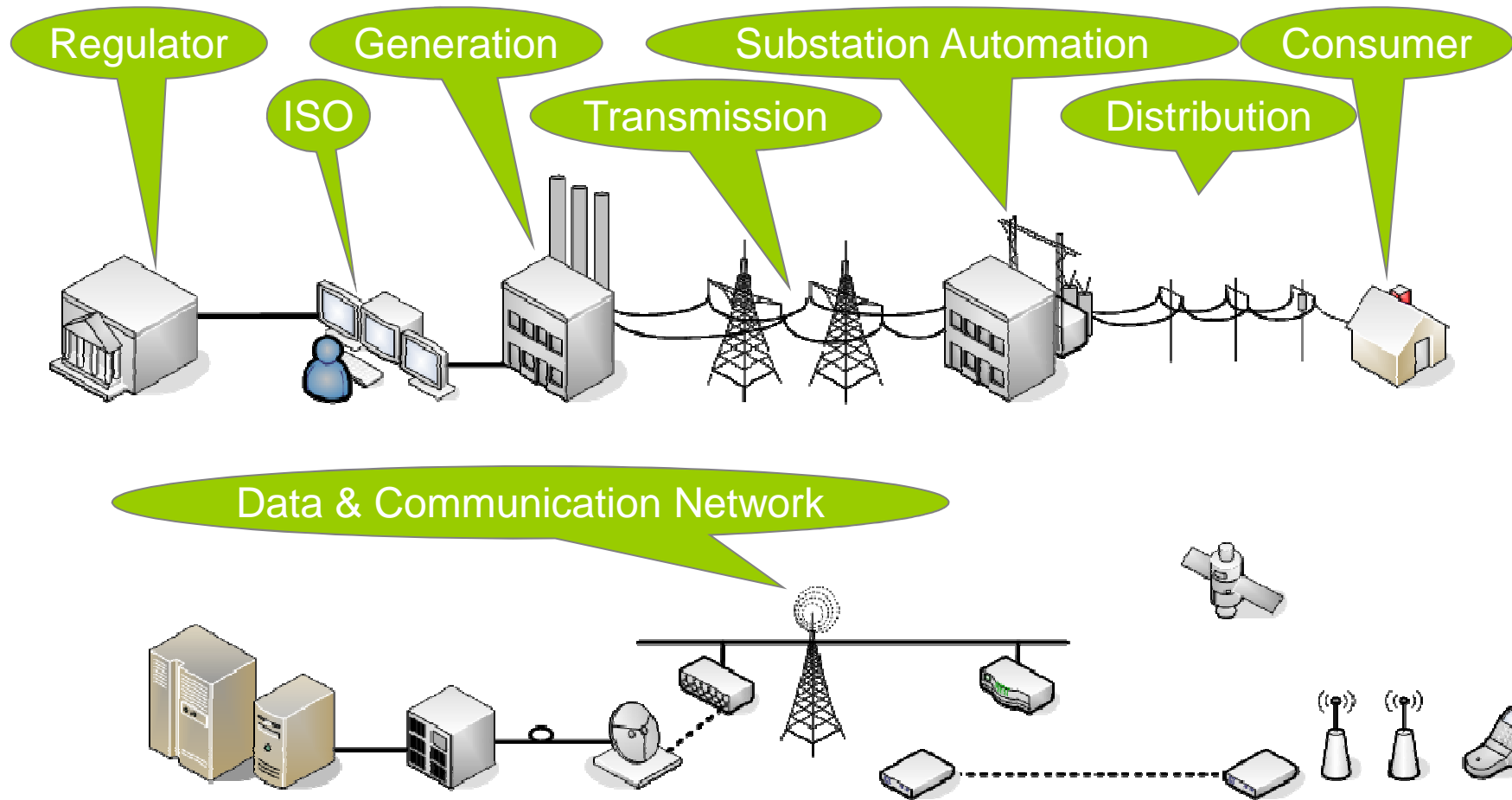


Source: EPRI Intelligrid

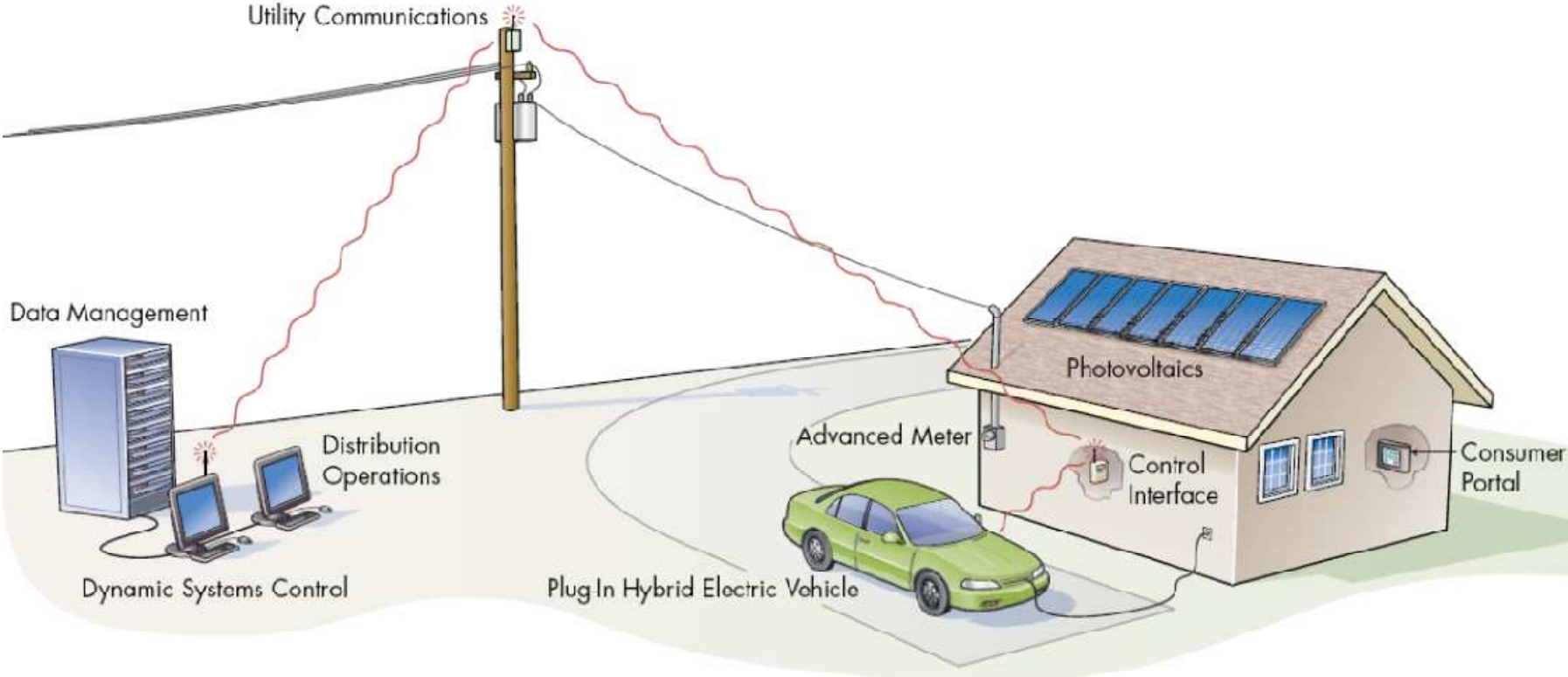
Smart Grid Infrastructure



Merge Communication & Power



Customer View of Smart Grid



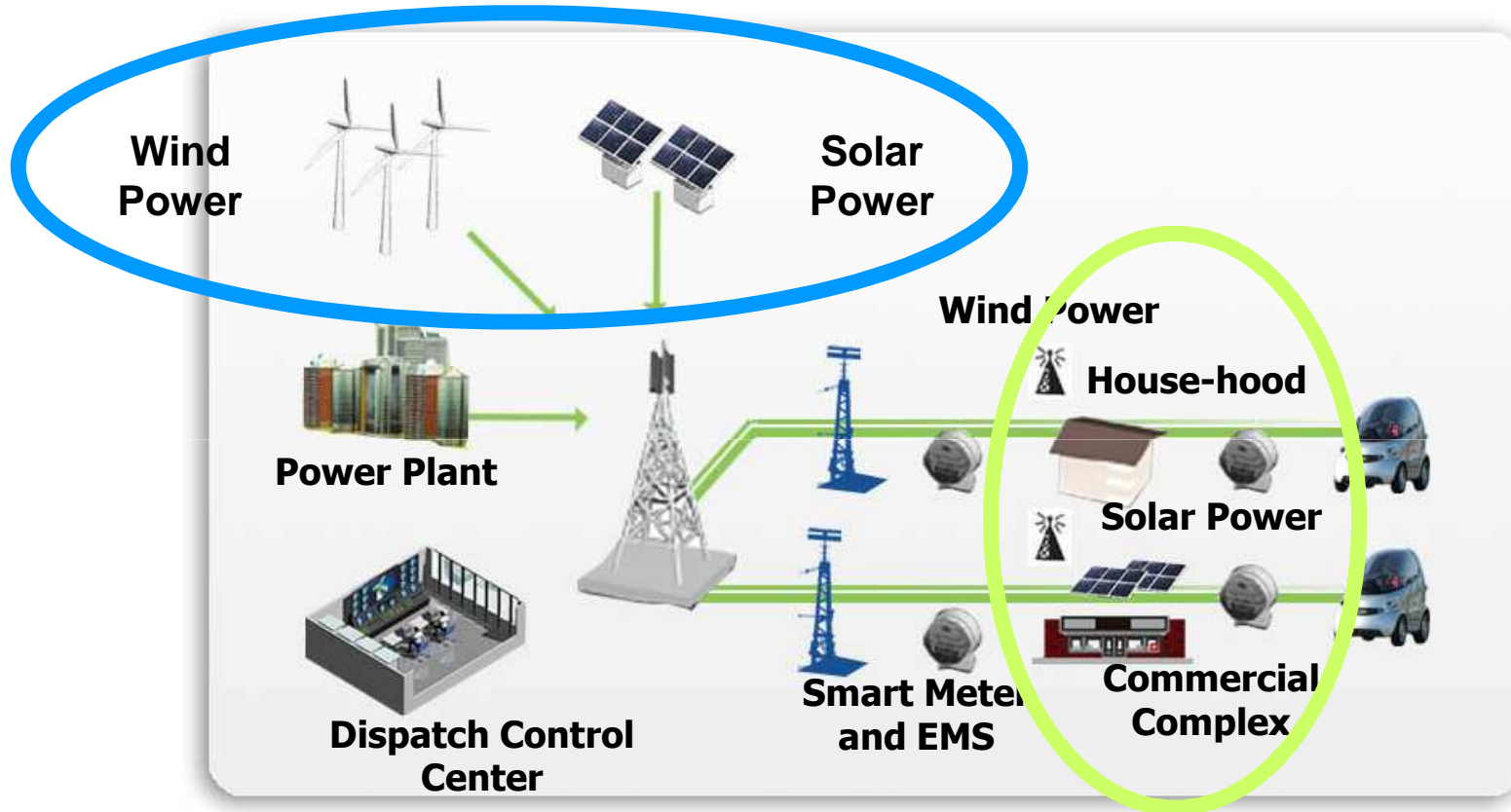
Source: EPRI



Agenda

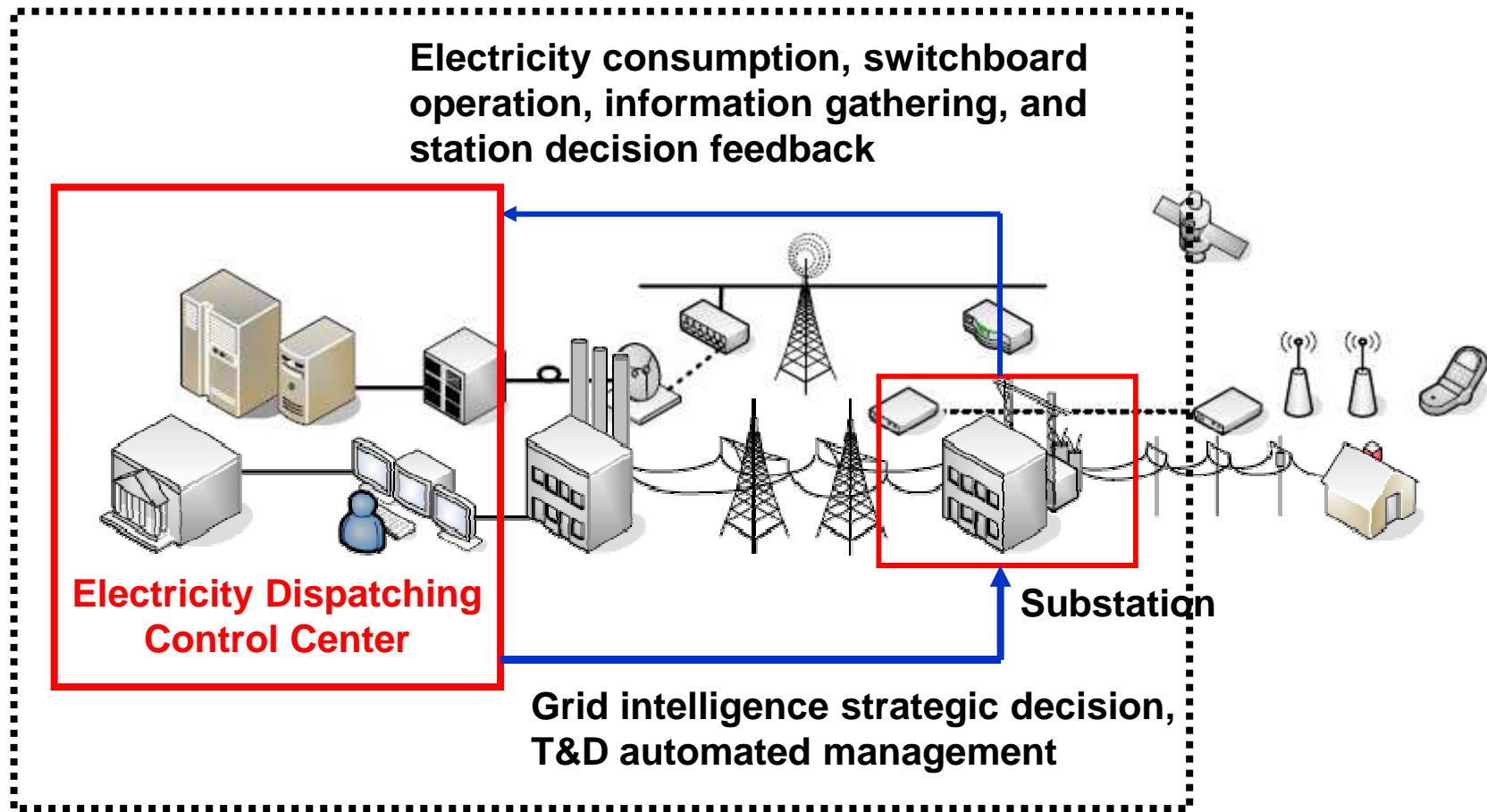
- Overview
- Structure
- **Successful Applications**
- Why Moxa?

Integrate Distributed Renewable Energy for Power Generation



Manage Integrated Distributed Renewable Energy via Energy Management Systems to handle **Alternative Generation** and **Demand Response**.

Substation Automation in Smart Grid

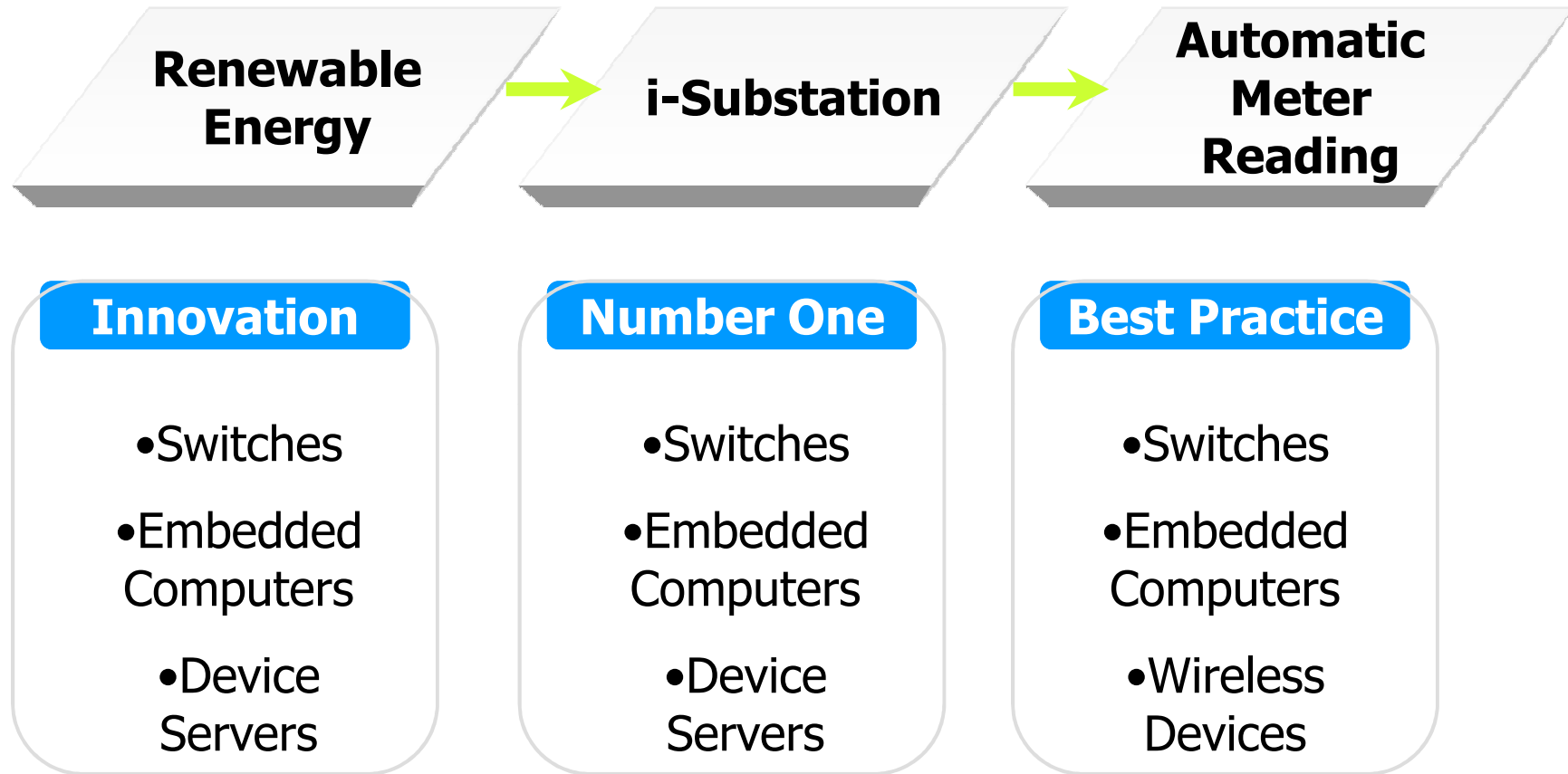


Common Standards: IEC 61850, IEC 60870, DNP3 ...

Agenda

- Overview
- Structure
- Market Share
- Successful Applications
- **Why Moxa?**

Moxa's **Complete** Solution to Create a **Smarter** Grid





Thanks