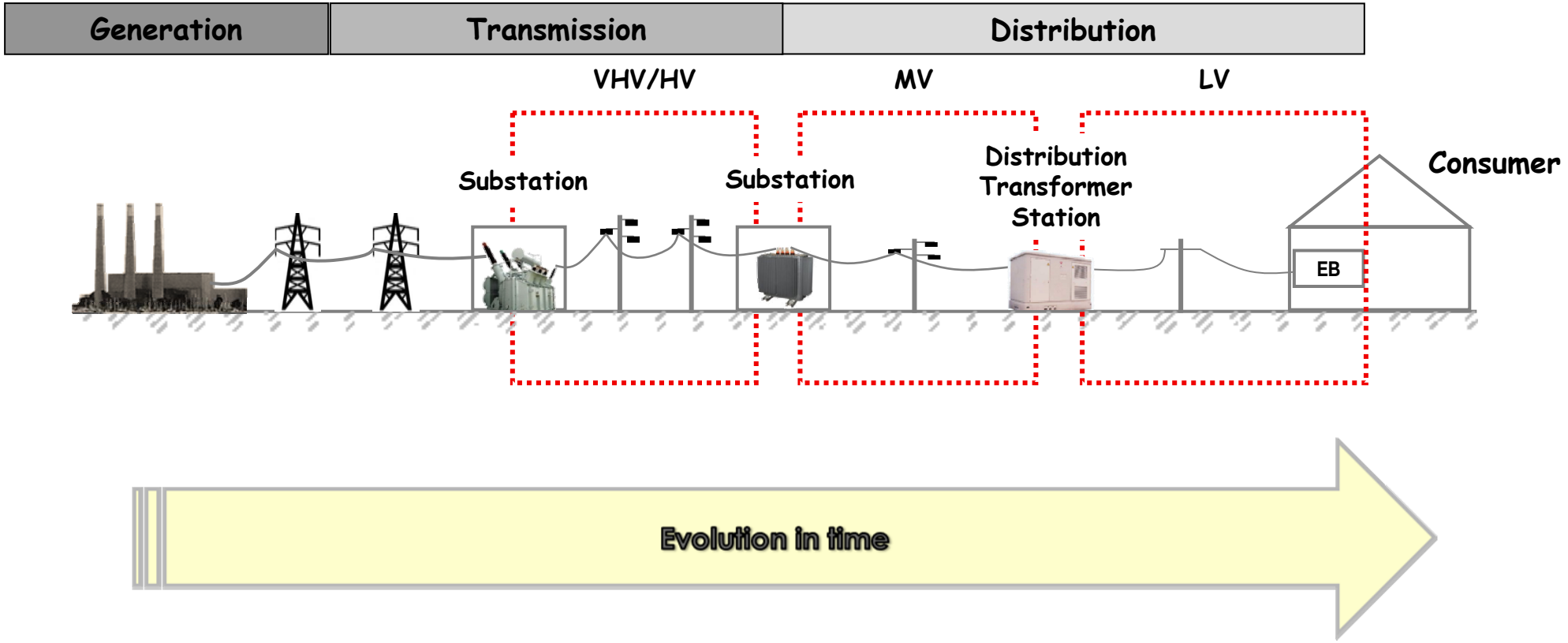
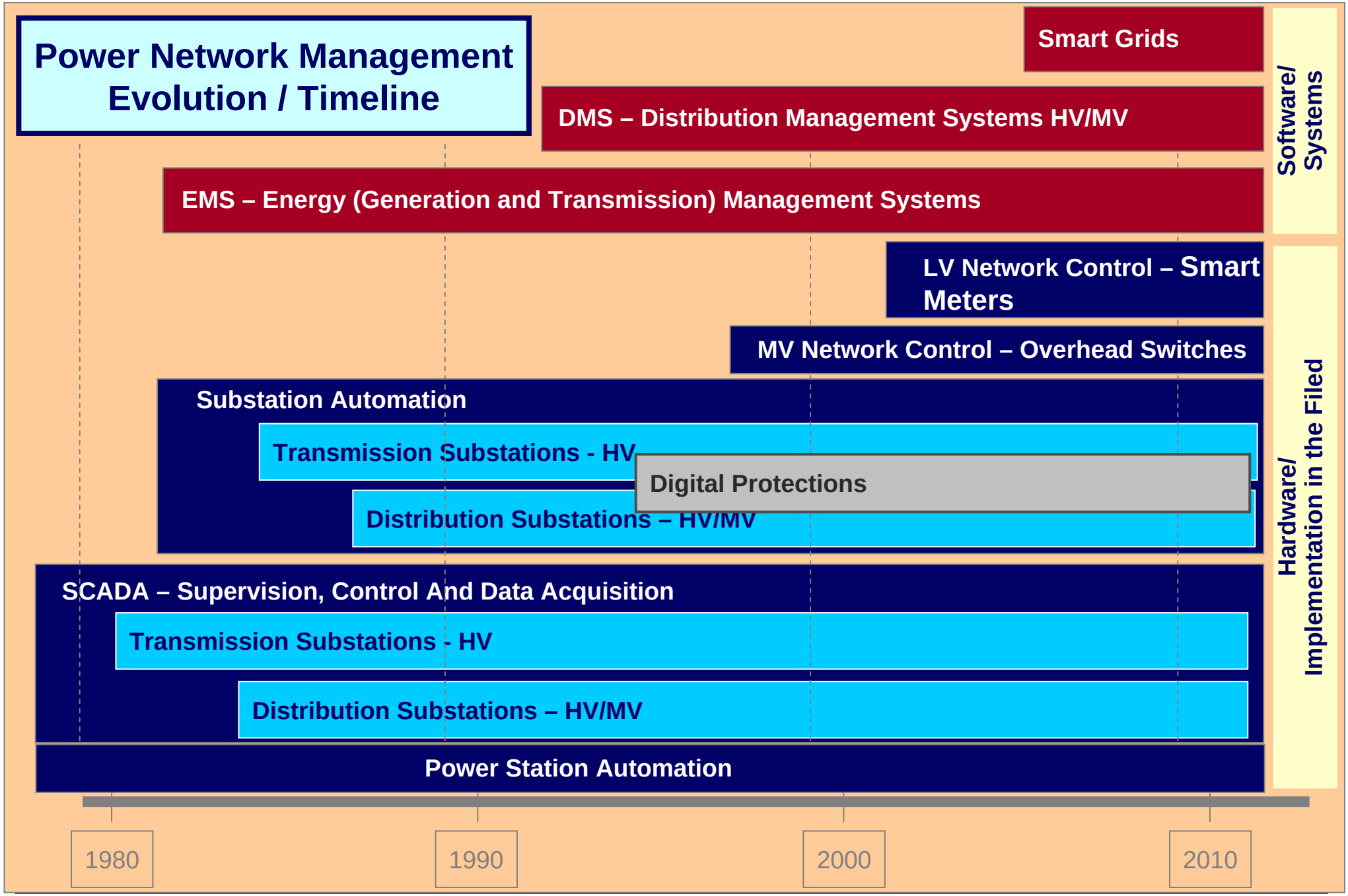
Smart Grids – an Evolution of Network Automation

Lisbon, 29th April 2011

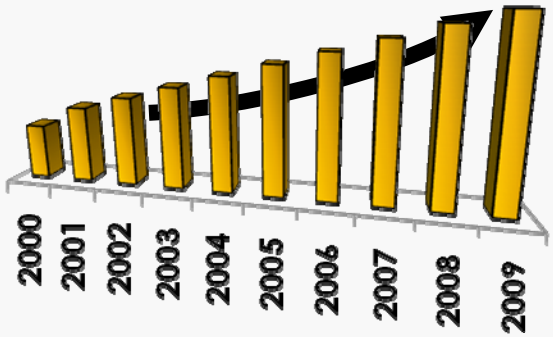
Network Automation – evolution during the years...



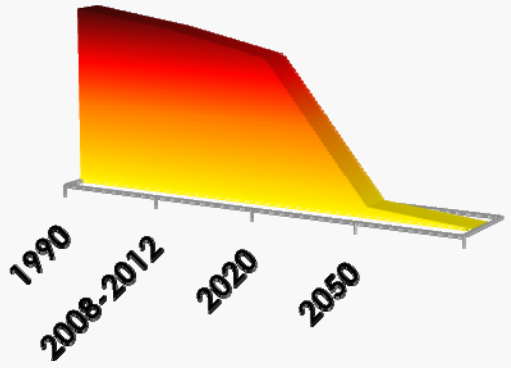

Power Network Management Evolution / Timeline
Smart Grids
DMS – Distribution Management Systems HV/MV
EMS – Energy (Generation and Transmission) Management Systems
LV Network Control – Smart Meters
MV Network Control – Overhead Switches
Substation Automation
Transmission Substations - HV
Digital Protections
Distribution Substations – HV/MV
SCADA – Supervision, Control And Data Acquisition
Transmission Substations - HV
Distribution Substations – HV/MV
Power Station Automation
Software/ Systems
Hardware/ Implementation in the Filed
1980
1990
2000
2010

Smart Grids: Reasons and Origins

Growing energy demand



Ambitious climatic goals



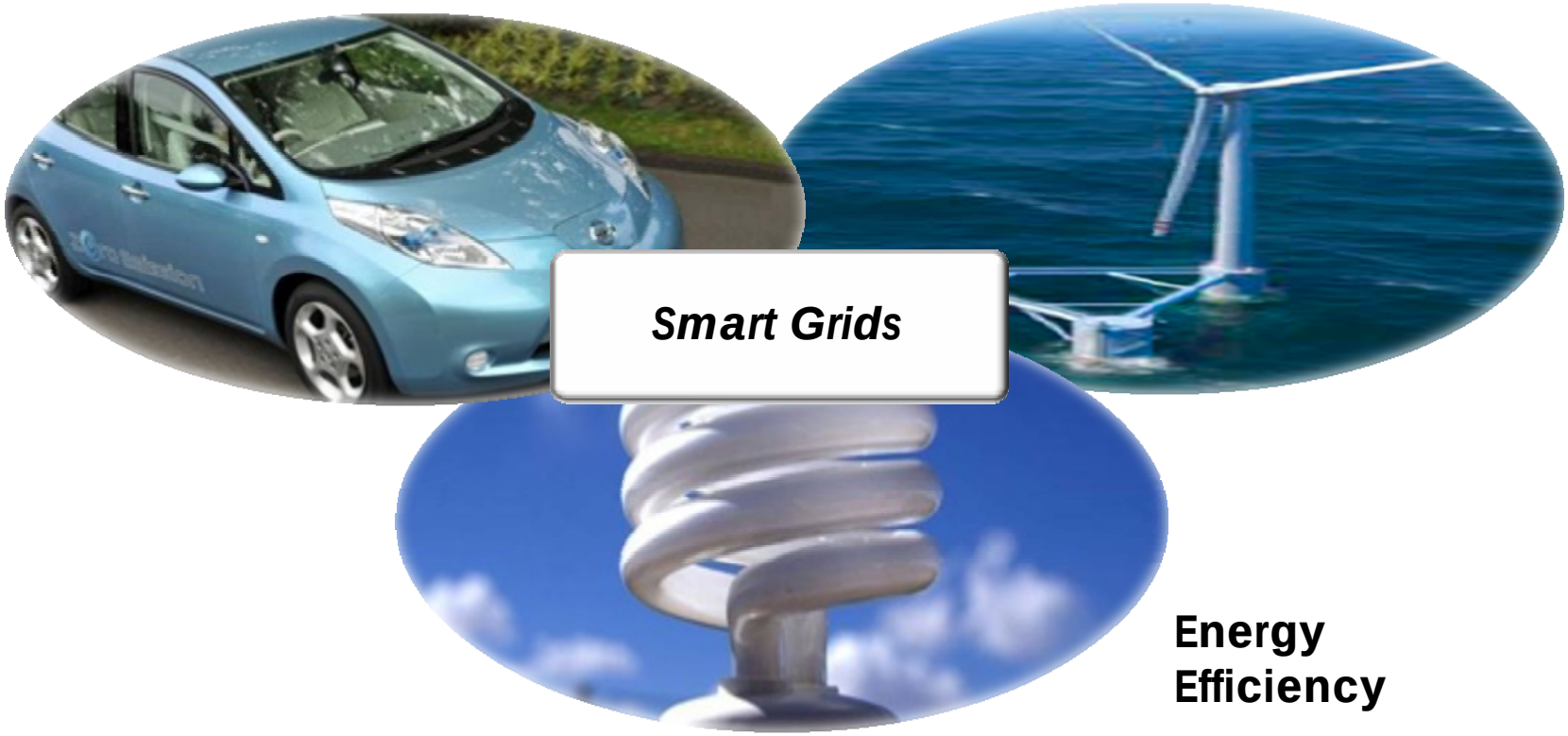
Integration of more renewables, electric vehicles and energy efficiency

The energy demand, combined with ambitious climatic goals, as well as with the integration of more renewables and the electric vehicle, push for increased flexibility of the electric power network

Smart Grids: Reasons and Origins

Electric Vehicle

Renewables

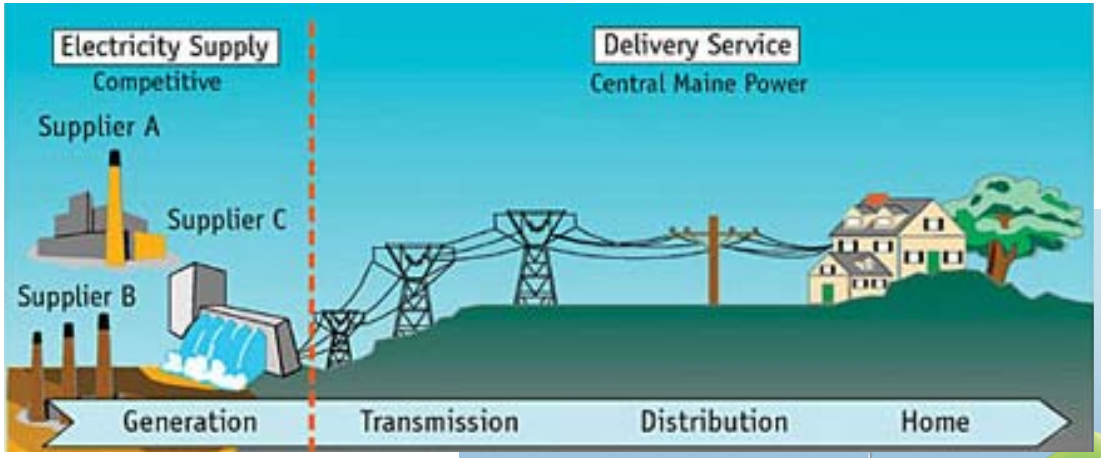


Energy Efficiency

The Smart Grids are the key element to achieve the proposed goals: more renewables, electric vehicles and increased energy efficiency

Smart Grids: Introduction to the Concept

Traditional Concept



Smart Grid

Smart Grids: Definition

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What is a SmartGrid?

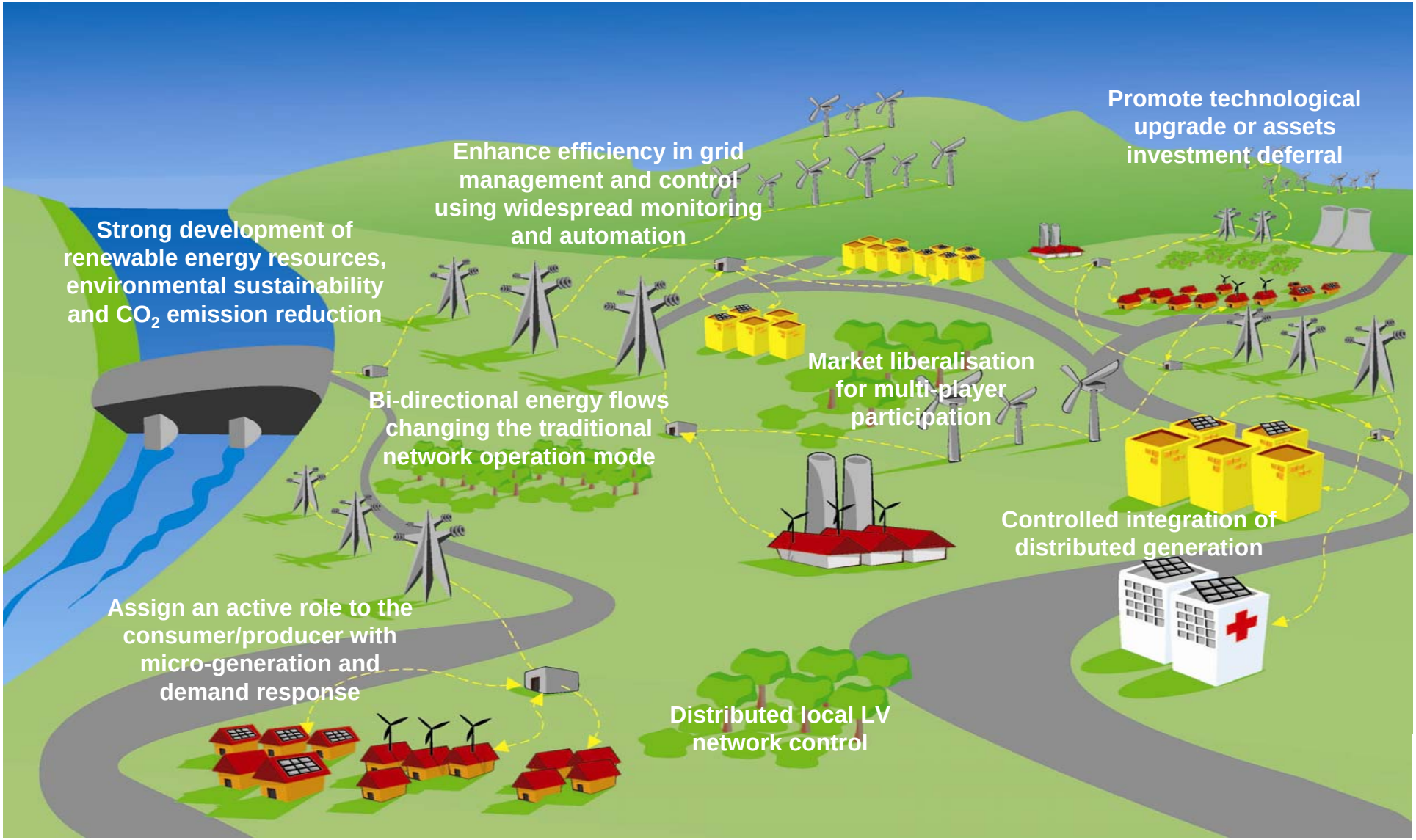
A SmartGrid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies.

A SmartGrid employs innovative products and services together with intelligent monitoring, control, communication, and self-healing technologies to:

- better facilitate the connection and operation of generators of all sizes and technologies;
- allow consumers to play a part in optimizing the operation of the system;
- provide consumers with greater information and choice of supply;
- significantly reduce the environmental impact of the whole electricity supply system;
- deliver enhanced levels of reliability and security of supply.

SmartGrids deployment must include not only technology, market and commercial considerations, environmental impact, regulatory framework, standardization usage, ICT (Information & Communication Technology) and migration strategy but also societal requirements and governmental edicts.

Smart Grids: The Concept



Smart Grids: Integration with other Automation Packages

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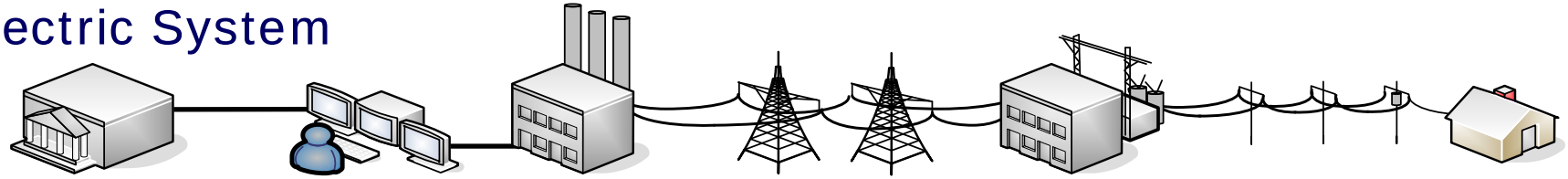
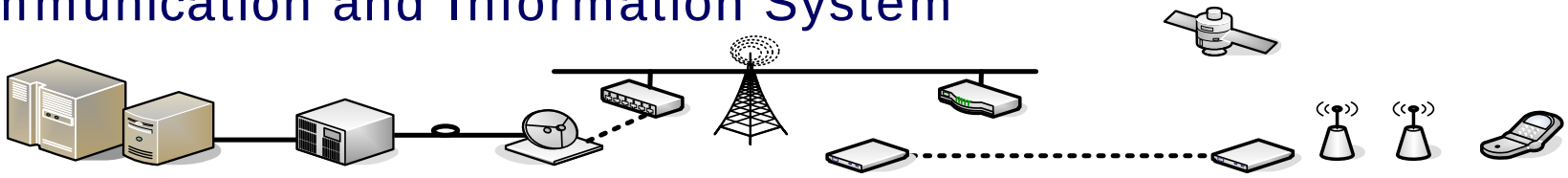
Electric System



Communication and Information System



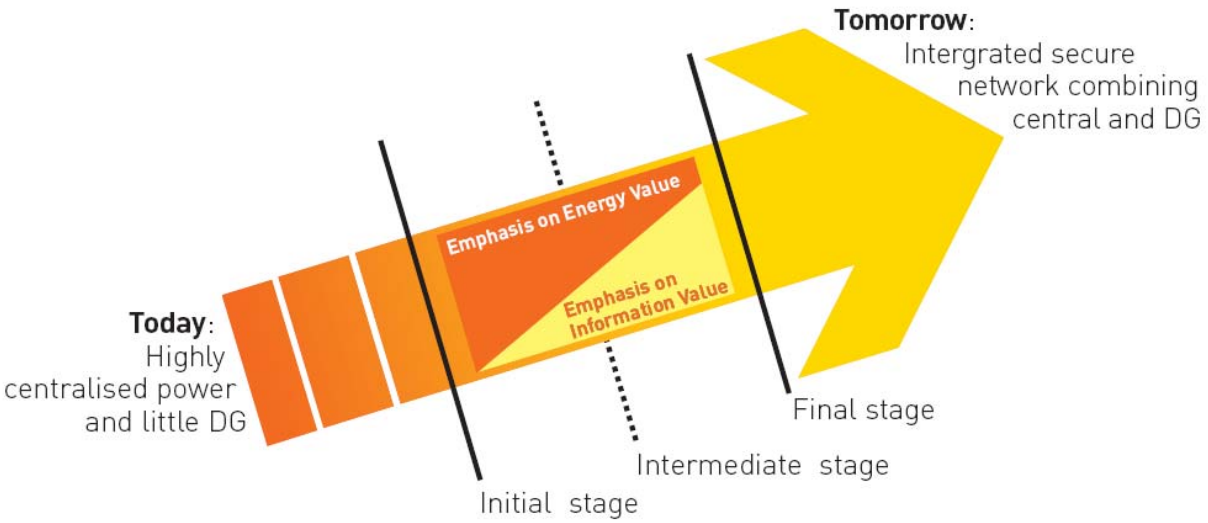
Main Functions:

Smart Grid

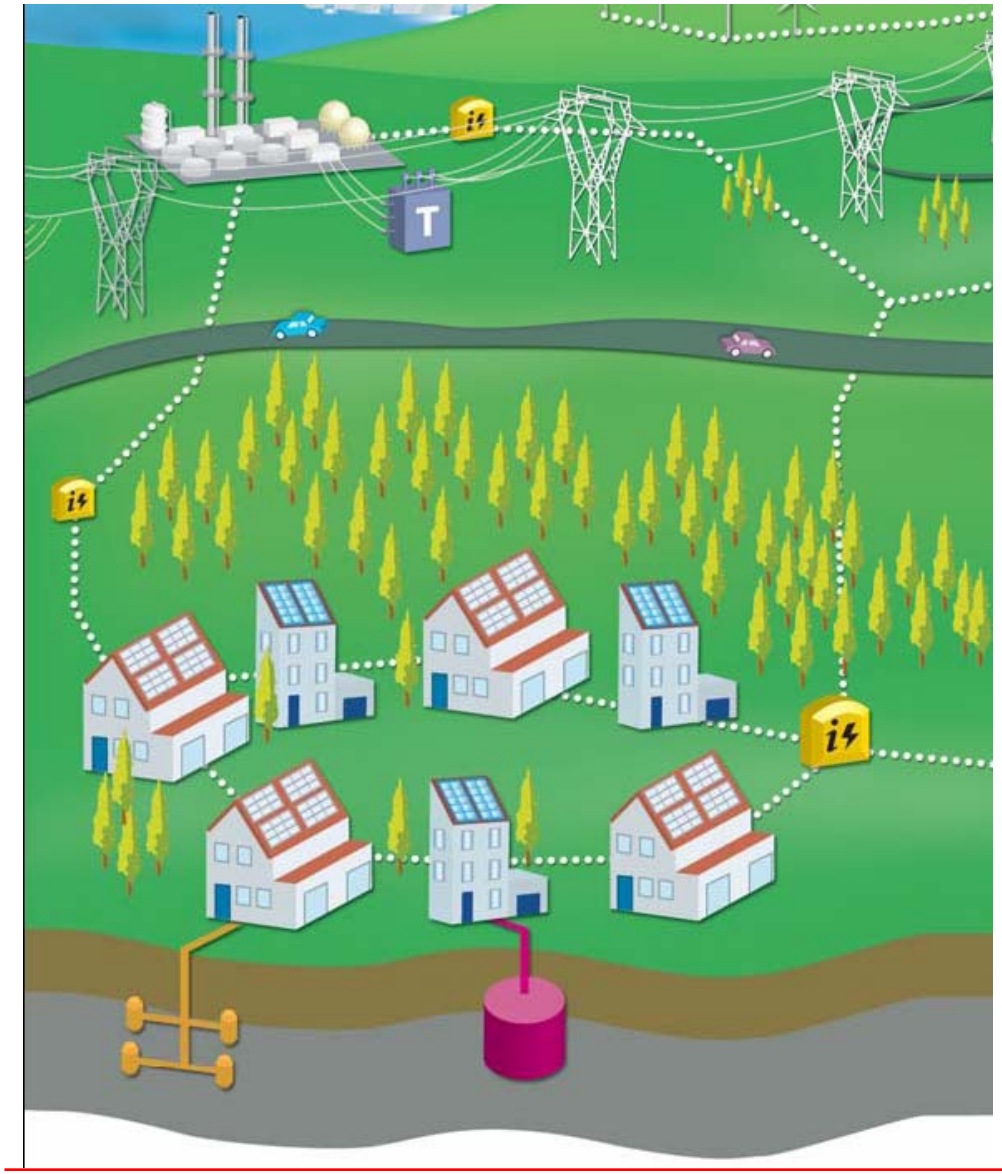
- Real-Time simulation and contingencies analysis
- Traditional SCADA Systems
- Self-Healing, area protection and operation in islanded mode
- Asset management and on-line equipment sensing
- Active demand management and dynamic energy prices
- Active energy markets participation

Smart Grids: Active Management

Power Network Management is evolving from a traditional concentrated generation configuration into a phase of high penetration of Dispersed Generation, Renewable Energy Sources, and Energy Storage, which will require an Active Management of the Smart Grid

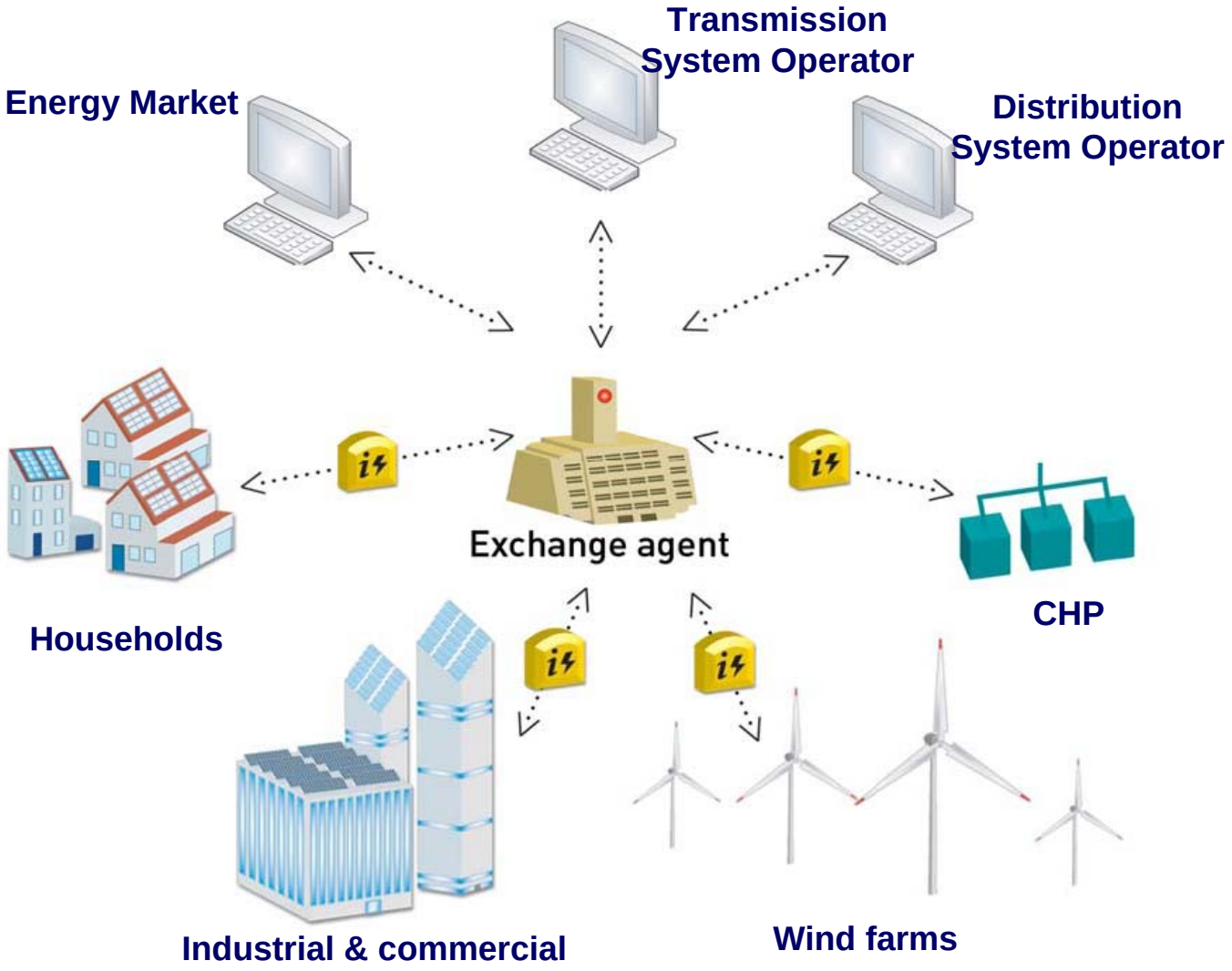


Smart Grids: New Network and System Types



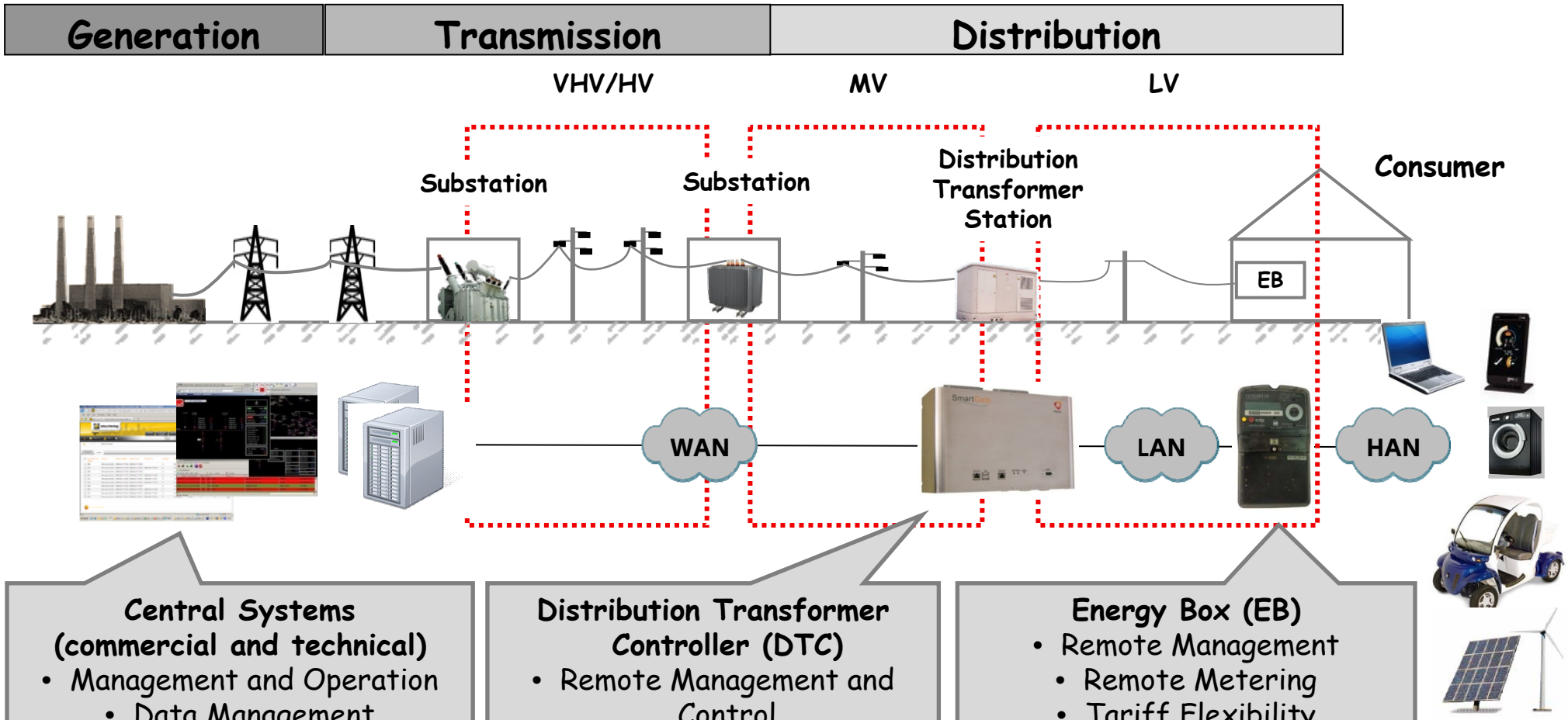
Power Networks are changing into a complex and interconnected grid, a mix of transmission, distribution and dispersed generation, which will provide the citizens with a reliable, efficient and environment friendly power supply.

Smart Grids: New Business Model



The <u>bidirectional energy and data circulation</u> between the customer and the supplier will improve the efficiency and will lead to the use of cleaner energies.

Smart Grids: New Management & Control Assets

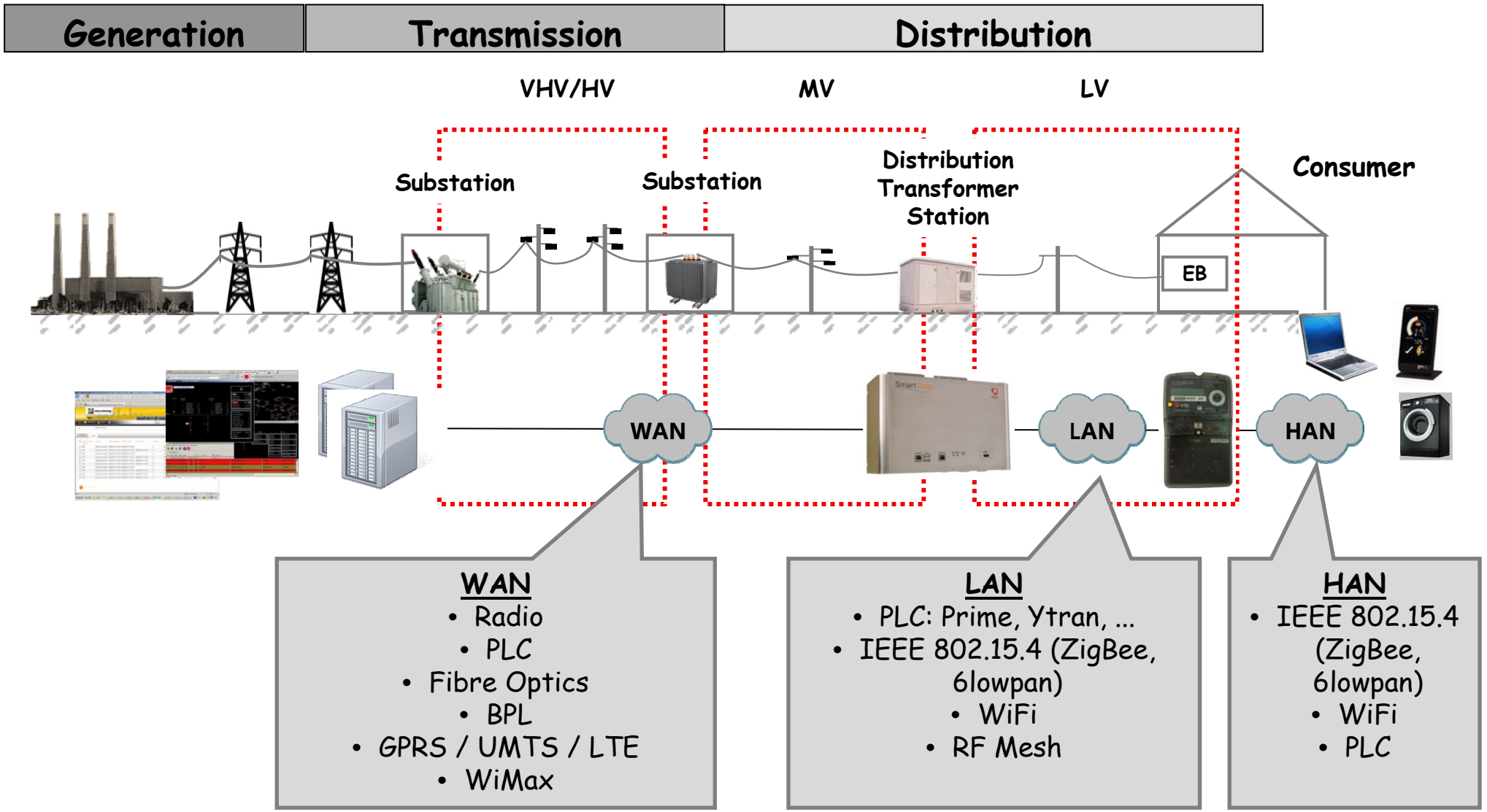


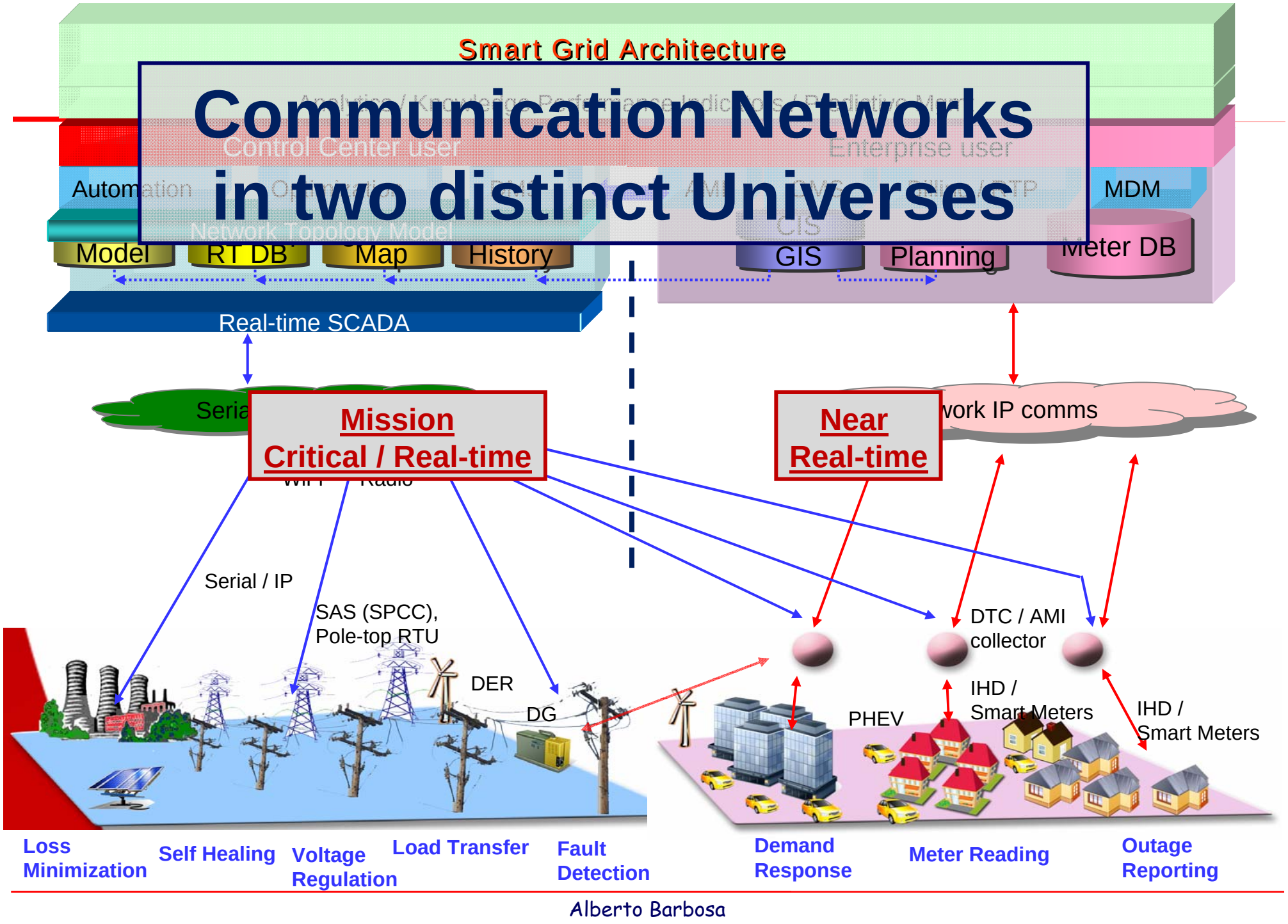
Central Systems (commercial and technical)
- Management and Operation
- Data Management
- Integration with Present Systems
- ...

Distribution Transformer Controller (DTC)
- Remote Management and Control
- Remote Metering
- Micro-generation Control (in the future)
- ...

Energy Box (EB)
- Remote Management
- Remote Metering
- Tariff Flexibility
- HAN Interface for Quality of Service Data
- ...

Smart Grids: New Communication Networks

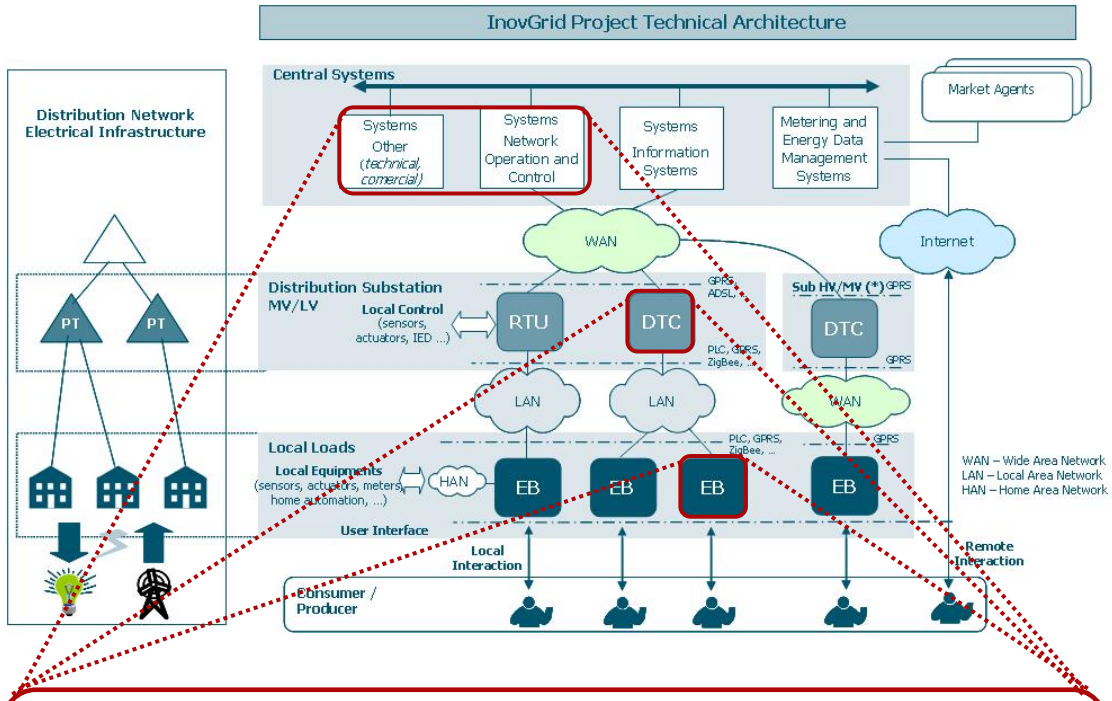




Alberto Barbosa


Consortium Members
Distribution
edp distribuição
EDP Group's company operating in the regulated distribution business in mainland Portugal. EDP Distribuição has assumed the role of partnership leader.
R&D and Innovation
edp inovação
A business platform that is the driving force behind the technological innovation processes of the EDP Group.
INESCPORTO
A technological institution, leader in the design, development and operational management of information systems and technological solutions, with a vast experience and engagement in the energy sector.
Solution providers for network management and metering related infra-structures
efacec
A Portuguese owned company that operates in the fields of automation, energy network management, energy generation, transport and distribution, with a strong technological component and a leadership position.
JANZ
contar
Portuguese capitals company with a broad experience in the design and manufacturing of equipment and systems in the field of metering and energy management.
Information Systems implementation
logica
A leading company in IT services with international experience in the utilities and telecommunications sectors. Provides Portuguese solutions in the fields of smart metering, network renewable generation management.
Support
Project Consultancy
noLimits CONSULTING
Business Consulting firm that supports top management in capitalizing on Information Technology to achieve and surpass business objectives.

Smart Grids: InovGrid Smart Electric Power Grid Efacec Participation



Distribution Energy Box Controller

Experience: Network Management & Automation

Experience in Power Network Management since 1980

- More than 50 Power Network Management Systems in operation
- More than 70 Power Plant Management Systems
- More than 800 Integrated Substation Automation Systems for Transmission or sub-Transmission Networks
- More than 20,000 Compact Automation Systems for Distribution Substation and Substation Automation

R&D Accumulated Experience

- More than 1,300 Men*Year of accumulated R&D effort
- 80 researchers in full time
- Annual investment: 8% Sales
- R&D outsourcing to Research Institutes, Universities and foreign R&D entities

Experience: Some References

Distribution Dispatch (Lisbon & Oporto; EDP - Portugal)

Régua Hydro Power Plants National Dispatch (EDP Produção - Portugal)

Azores Transmission Network and Production Dispatch (EDA - Portugal)

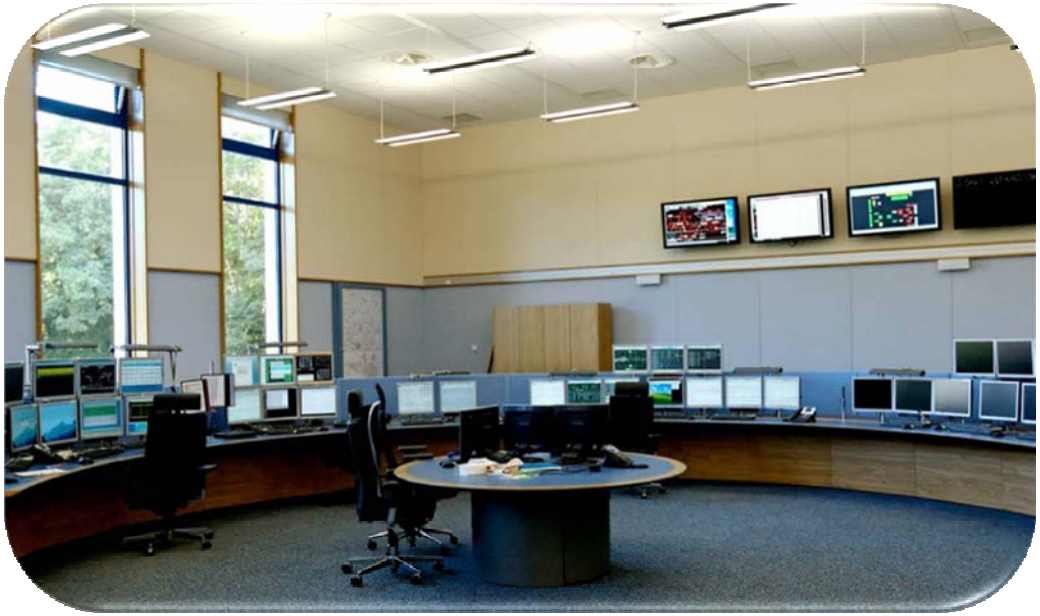
Particles Accelerator Power Network Control Centre (CERN - Switzerland)

Baia Mare Dispatch (SC ELECTRICA - Romania)

10 Distribution Dispatches (ELECTRICA MUNTENIA NORD - Romania)

3 Distribution Dispatches for Algiers, Tipaza and Boumerdès (SONELGAZ - Algeria)

USA



CERN, Geneva, Switzerland

Experience: Some References

Sfax Distribution Dispatch (STEG - Tunisia)

Casablanca Power, Water and Effluent Dispatch (LYDEC - Morocco) *

Amman Dispatch (JEPCO - Jordan)

Transmission Network and Production National Dispatch (EDM - Mozambique)

Rio de Janeiro State Transmission Network Dispatch (AMPLA - Brazil)

São Paulo State Transmission Network Dispatch (BANDEIRANTE - Brazil)

* in progress

REFER Control Centre - Portugal

EDP Distribuição, Porto, Portugal

Experience: Some References

Mato Grosso do Sul State Transmission Network Dispatch (ENERSUL - Brazil)

Espírito Santo State Transmission Network Dispatch (ESCELSA - Brazil)

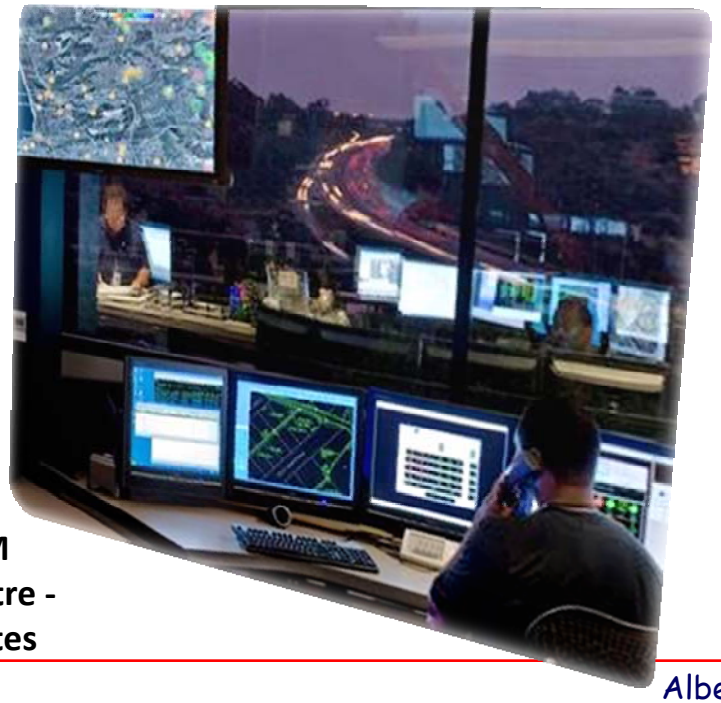
Vung Tau Distribution Dispatch (PC2 - Vietnam)

Athens Dispatch (PPC – Greece) *

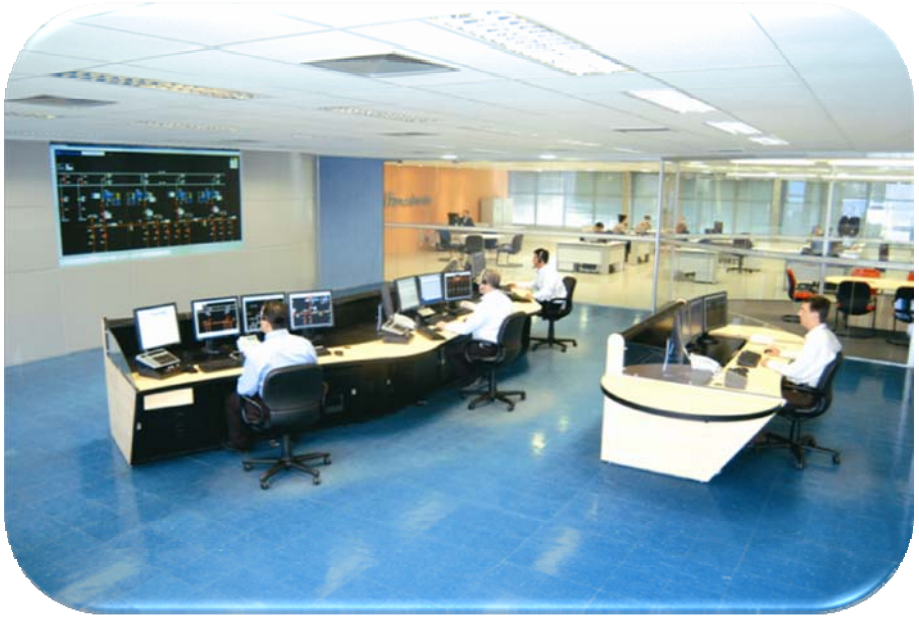
Greek Islands Dispatch (PPC – Greece) *

Bangalore Dispatch (BESCOM – India) *

* in progress



ANAHEIM Control Centre - United States



BANDEIRANTE Control Centre - Brazil

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Thank you

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