



From Smart Metering to Smart Grids

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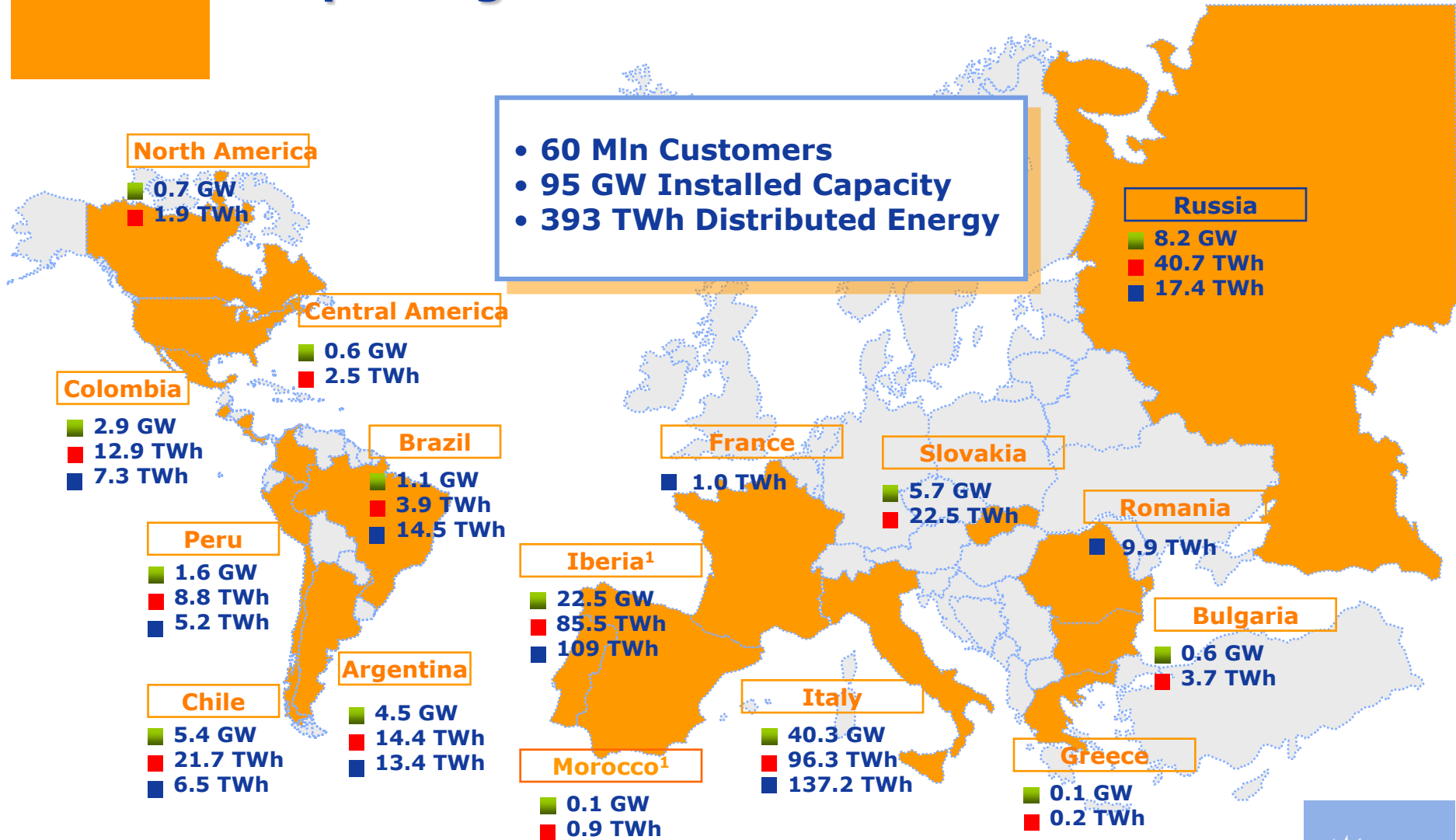
Outline

- Presentation of the Enel Group
- Network Operators SG scenario
- Smart Grids technologies implemented in Enel
- Enel's Smart Grids demonstration projects
- Enel's Smart Grids Roadmap

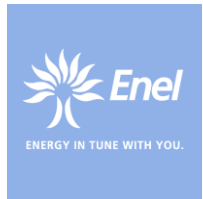
Enel Group at a glance

- 2008 Installed capacity (GW)
- 2008 Net production (TWh)
- 2008 Tot sales to final customers (TWh)

• 60 Mln Customers
 • 95 GW Installed Capacity
 • 393 TWh Distributed Energy



An international integrated energy player



Infrastructure and Networks Division

Electricity networks Business Area

- 4 Macro-Regions
- 11 Local Branches
- 11 Control Centers
- 115 Offices
- 19.000 Employees
- Over 1.100.000 km lines
- About 2.000 HV/MV Substations
- Over 400.000 MV/LV Substations
- 32 million customers
- **72.000 Renewables connected for 6,6 GW**



Public lighting Business Area

- 5 Local Branches
- 330 Employees
- 1.925.000 Spot-lights
- 4.000 Municipalities served

Gas network Business Area

- 4 Local Branches
- 21 Control Centers
- 1.300 employees
- 630 Primary Plants
- About 30.600 km gas pipelines
- 2 million customers

The 2^o largest Distribution Operator in Europe

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Network Operators Scenario

External Drivers

- Security of supply
- **20-20-20** EU Goals
- Change in electricity consumption
- Large increase of unpredictable renewable energy sources
- The EU Third Energy Package

Internal Drivers

- Reduce the **total costs** of the power system
- Replacement of **ageing infrastructures**
- Integrate **low-carbon generation** sources
- Support **energy efficient demand side technologies**
- Enable the **active participation** of customers to the energy market
- Enable the **electrification** of the **transport sector**
- Increase the network **flexibility** to face 2050 scenarios

Networks are strategic enablers of the new Scenario

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Enel network is the largest Smart Grid in the world

Solutions deployed



Automatic Meter Management

- ▶ Telegestore is fully operational on > **32 Mln** Customers
 - ▶ Leading Technology
 - ▶ Excellence in operation



Network automation

- ▶ HV and MV network remotely operated
- ▶ More than **100.000 MV** substations remote controlled
- ▶ Automatic fault clearing procedures



Work Force Management

- ▶ **5.200** vehicles equipped
- ▶ Logistic support to Enel crews
- ▶ ENEL cartographic available on board
- ▶ All processes through mobile applications
- ▶ Connection from field to the centre for Enel crews

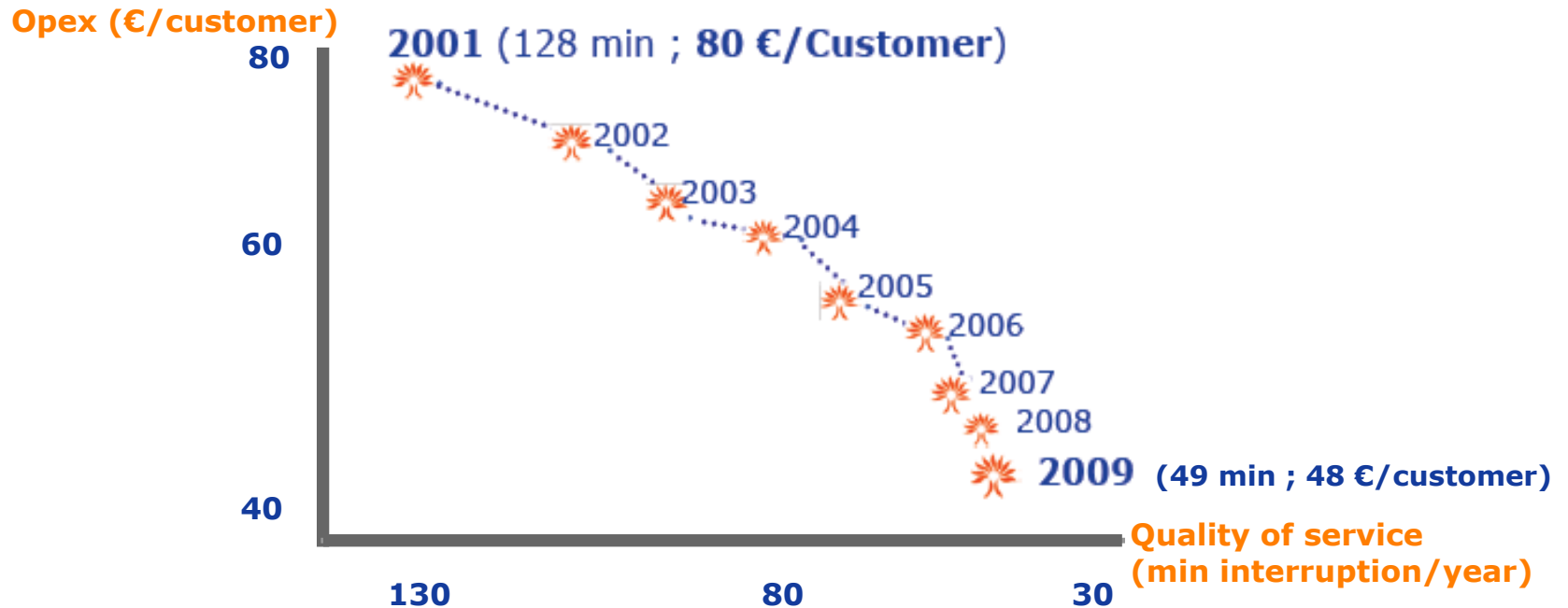


Asset Management

- ▶ Cartographic census of network assets
- ▶ Database of network events (power outage notification, fault detection ,etc)
- ▶ Optimization of network investments based on a risk analysis.

Investment exceeding € 2,5 bn
Dramatic reduction of cash-cost per customer

The work done: Results



Cost leadership and operational excellence

930€mn yearly opex savings vs 2001

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Priority demonstration projects

Smart network and Large Scale Integration of Renewables

- New network design rules
- Development of storage capacity
- Advanced control function
- Standardized ICT solutions to integrate massively RES
- Advanced network maintenance and supervision tools
- Optimal distribution grid operation in areas with high RES generation



e-Mobility Infrastructure

- Extended electricity recharge infrastructure
- e-Seaport



Active Demand

- Load control (peak shaving and energy savings)
- Demand Response program on a large customers base
- Integration of energy management systems, home appliances and Home Automation networks and services

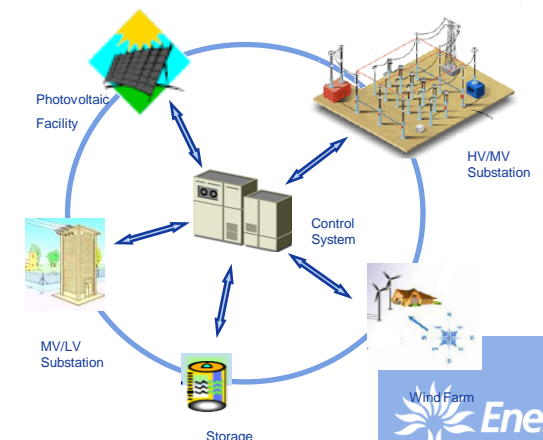


Active Control for Distributed Energy Resources connected to the MV network

Active Control of Distributed Energy Resources (DER) connected to the Medium Voltage network

The project will deal with:

- Realizing an **advanced control system**
- Implementing an **"always on"** and **standard-based communication solution** connecting all the relevant nodes in the network, including DER locations.
- Implementing **Voltage Control (at all nodes) and Power Flow Control** in the MV network.
- Developing new procedures for managing **efficiently** and **reliably** the **Disconnection of DER units in the event of unwanted islanding operations.**
- Testing/implementing **network operation in meshed mode.**



Electric vehicles recharging infrastructure

Enabling large scale electric mobility

Smart recharging network to overcome functional and technological barriers for large scale Electric Mobility



- ✓ Enable new advanced services to manage the **billing and recharge process**
- ✓ Innovative technologies in a **standardised framework**
- ✓ Include Smart Grids functionalities such as load management and storage

2010 -2012

Pilot test: 500 recharging points in 3 cities

FP7 Call on Electric Vehicles

2012 -2019

Roll out



Enel
ENERGY IN TUNE WITH YOU.

The Enel Smart Info project

- ▶ The Smart Info is an innovative device needed to build customer consciousness on energy consumptions.
- ▶ The Smart Info will collect data from the Enel smart meter and publish them to different customer interfaces (e.g. PC, TV, custom display, appliances)
- ▶ The Smart Info will be the first step to create a new energy services marketplace:
 - ▶ Automatic load management
 - ▶ Networking with smart appliances
 - ▶ Energy efficiency
 - ▶ Active demand services



2010 -2012

2012 -2019

Design, development and Pilot
Test

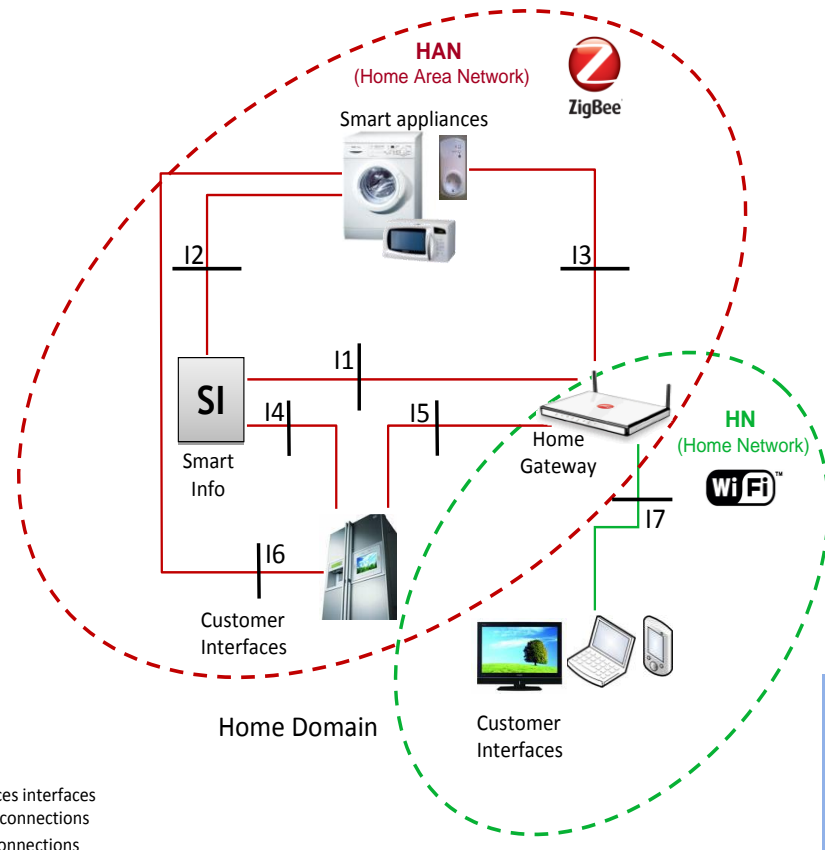
Roll-out

Energy@Home (E@H) Project

Energy@home is a **collaborative project** between



- Development of a communication platform for collaboration of devices in the Home Area Network (HAN) in order to enable provision of Value Added Services based upon information exchange related to energy usage
- The project envisions a standard protocol based on ZigBee technology.
- Focus on technology



Road to full active demand

Smart Meter



- Invoices based on actual power consumption
- Remote contract management
- Tailored tariffs

Smart Info



- Consciousness on energy consumption
- Available data collected from the smart meter to the indoor environment



- Open and standard platform for the indoor communication between meters, home appliances and broadband gateways

Address project

address

interactive energy



Project cofunded by the European Commission within the 7th framework Programme

Active Distribution Network with full integration of Demand and Distributed Energy Resource

Full Active Demand

The Starting Point

Using Telegestore know-how

International cooperation

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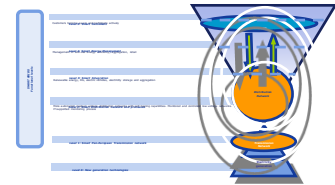
Enel's Smart Grids Roadmap

Level of Smart Grids deployment

FULL SMART GRIDS ROLL-OUT

20-20-20

EUROPEAN ELECTRICITY GRID INITIATIVE



FP7 DEMONSTRATIONS

- Active Distribution Networks
- EV/PHEV Infrastructure

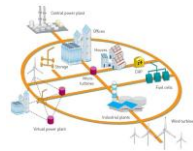


EU FP7 R&D

- address
- G4V

ENEL PROJECTS

- Smart Info, Active Demand, IPnetwork, E Mobility



ENEL DEPLOYMENT

- AMM
- Network automation
- WFM
- Asset Management



2000

2010

2020



Thanks for your kind attention!