Smartcities Endesa

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endesa

a global operator of electricity and gas

Present in:
10 countries

Installed capacity:
39 GW

Production:
147 TWh

Customers:
24 million

Employees:
27.000

Gas sold:

11bcm

Enel Group: an international energy operator

Presence in

40 countries

Annual output (FY2011)

293.8 TWh

Installed capacity*

97,366 MW

(34,933 MW renewable)

EBITDA (FY2011)

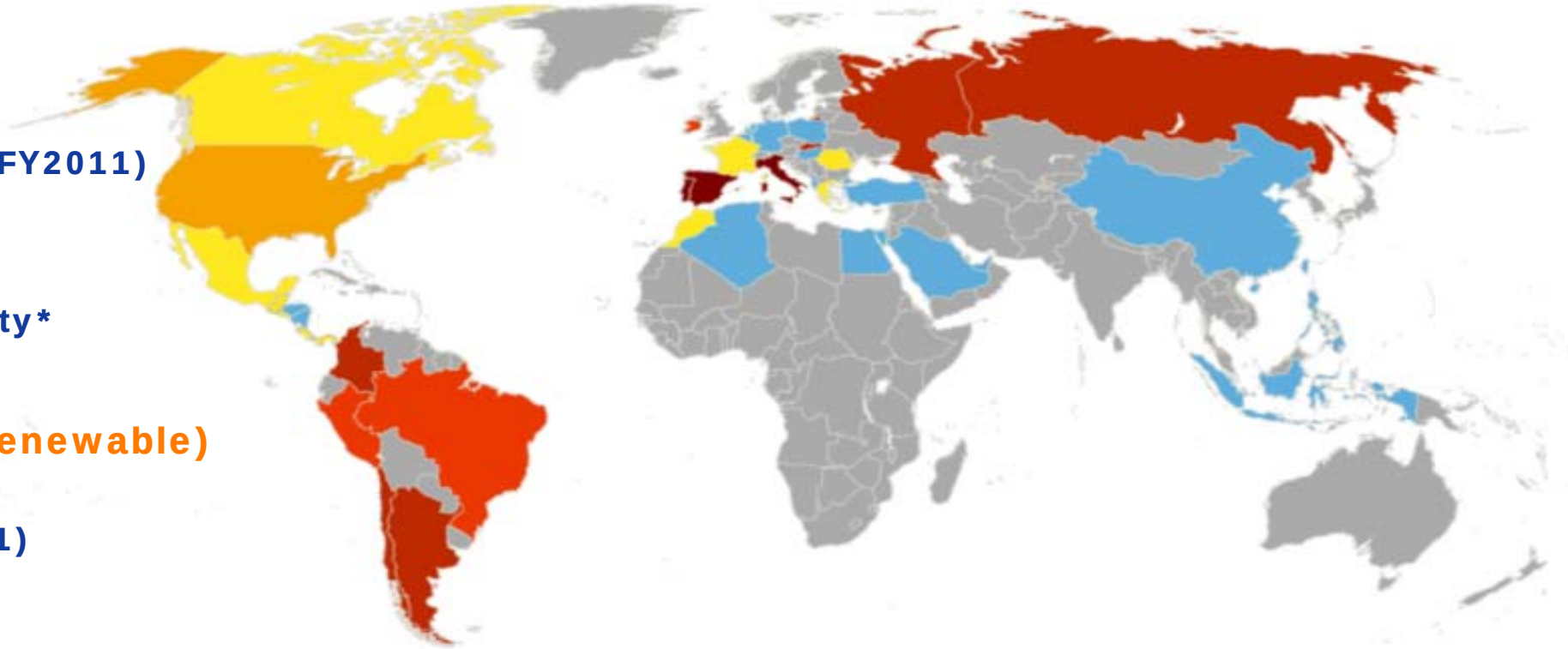
17.7 bln €

Customers*

60.9 mln

Employees*

75,360

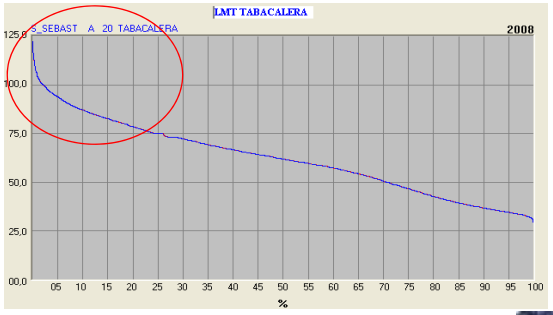


Italy's largest power company and one of Europe's main listed utilities

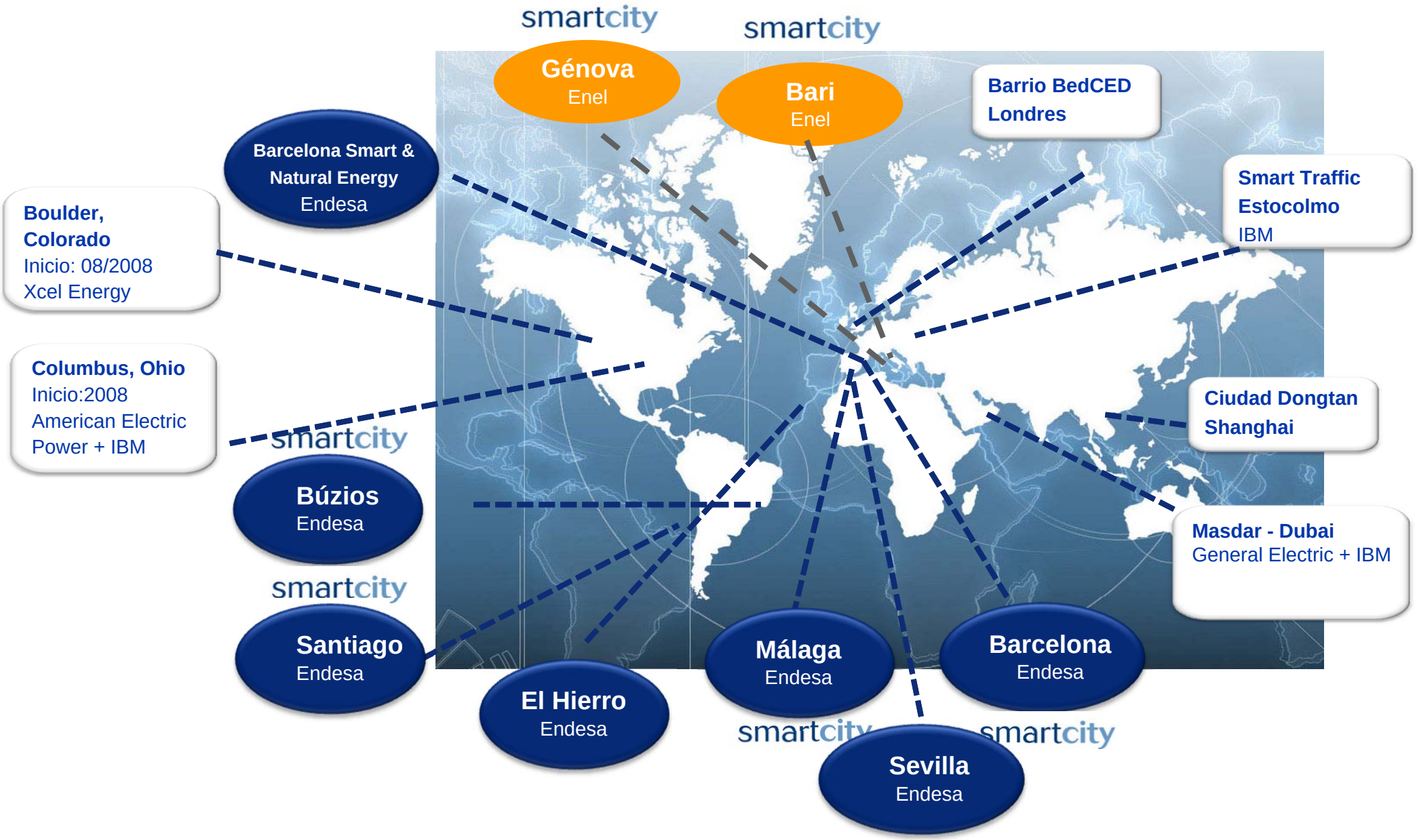
Present throughout the entire electricity and natural gas value chain

* *Data updated to 31/12/2011*

Smartgrids: New elemente in the network. New technologies. ICT



Smart Cities Projects Enel Group



Smartcity Málaga. Scope of the project

- 31 million budget for companies and research centers
- 4 year and fully functional, technology in the field and important involvement of final customers
- Design and deployment, analysis of results, final reports, and dissemination activities
- “Living lab” to test new products and services, proof of concept
- “Demo projects call other projects”, new opportunities will arise as a consequence of this project

Participants

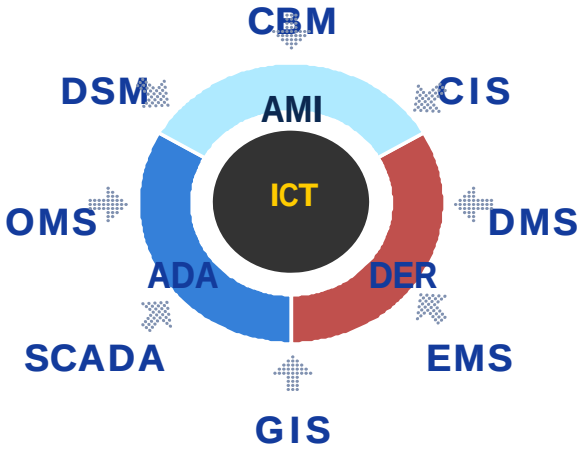
Project coordinators

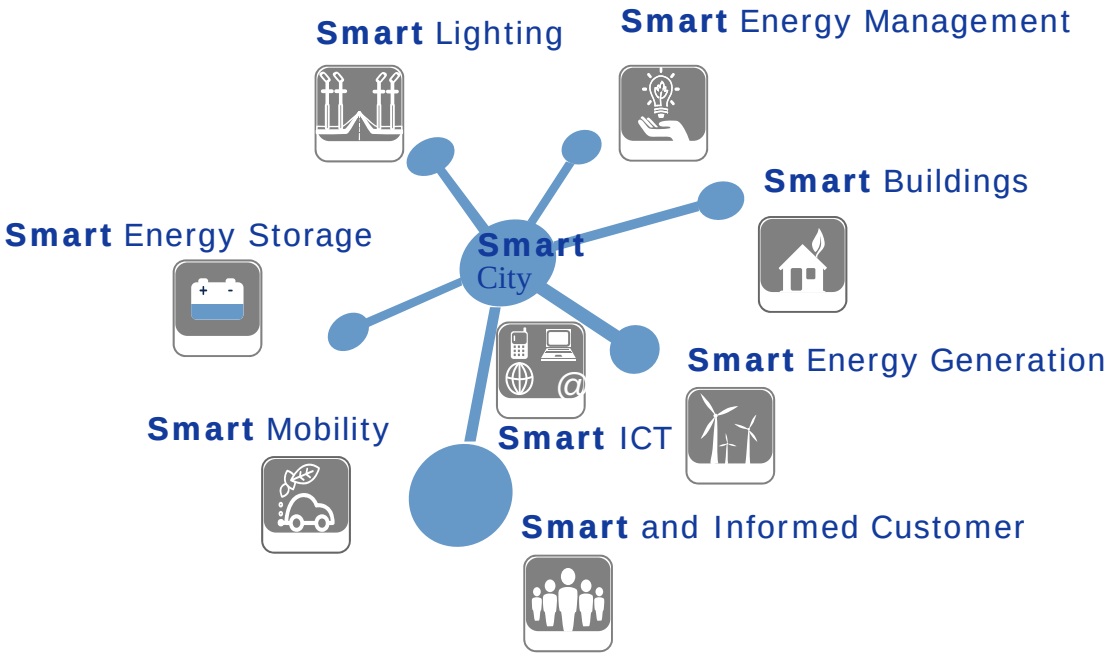
Research centers

Location: Malaga, new seawalk

- **MV and LV generation**
- **MV grid automation, new grid**
- **Friendly customers** form demand response applications
- **New expansion area** residential
- **Possibility to incorporate other local initiatives** Smart House, G4V, Green Emotion
- **Support from the governments**

SMART GRIDS The electric company of the future.





Comunications

- Real-time IP network

AMI (Advanced Meter Infrastructure)

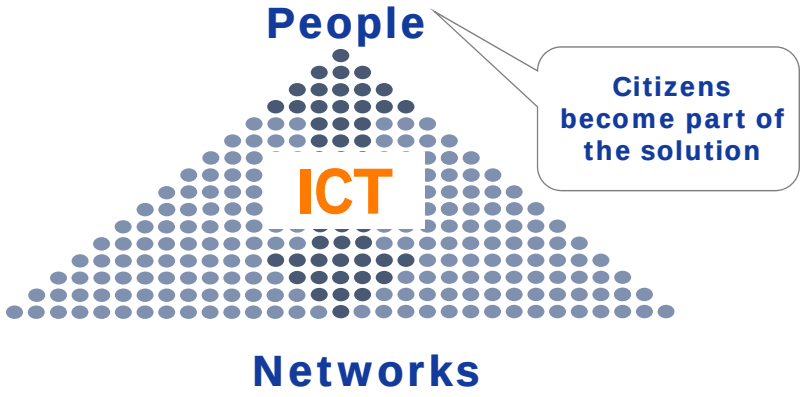
- Smart meters (electricity, water and gas)
- Demand response
  - Smart buildings and homes
  - Smart and informed customers

ADA (Advanced Distribution Automation)

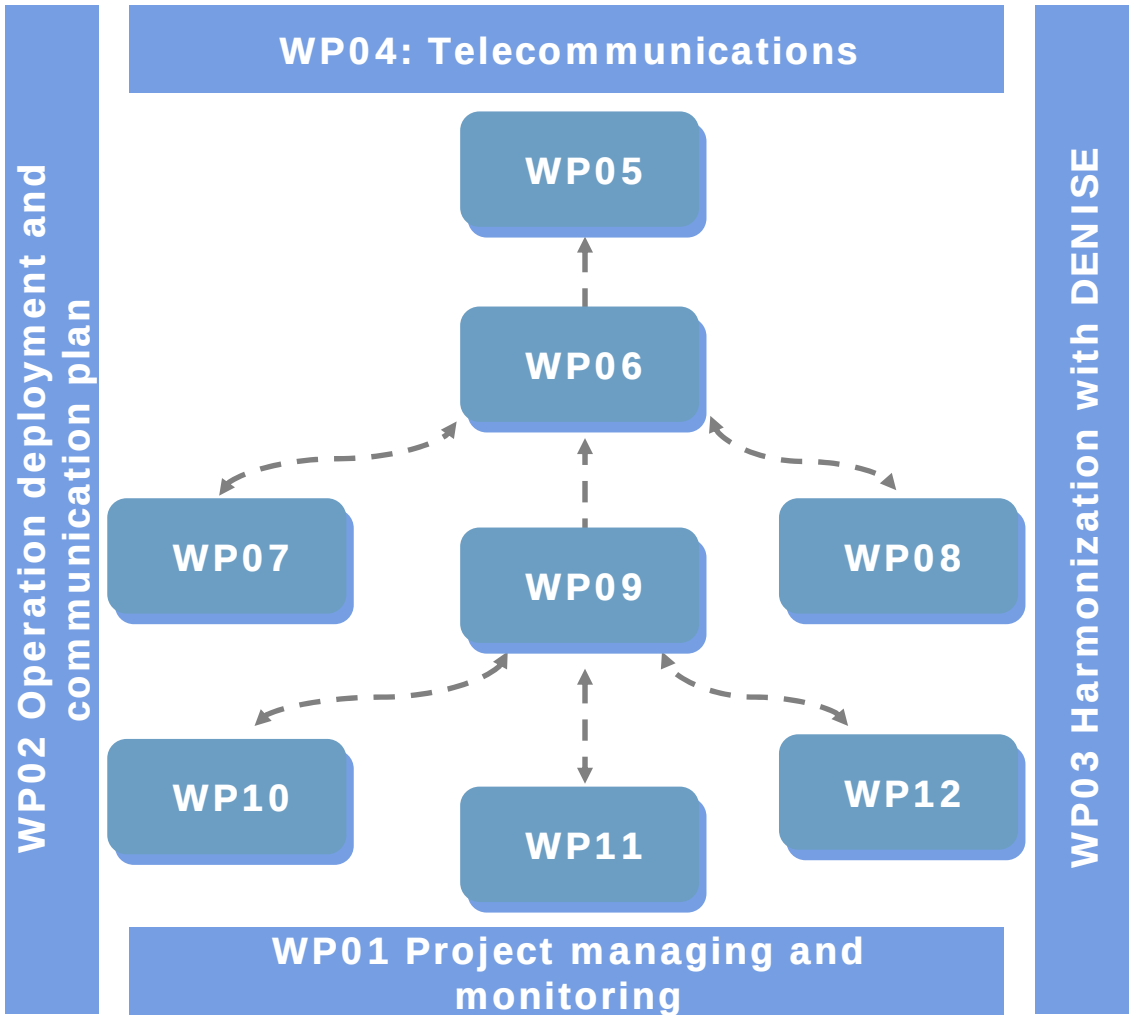
- Real-time monitoring
- Network failure and recovery
- Network automation

DER (Distributed Energy Resources)

- Electric vehicles
- Energy storage
- Distributed generation of renewable sources



WorkGroups



WP01 – Project Management

WP02 – Deployment and Communication

WP03 – Coordination DENISE

WP04 - Telecomunication

WP05 – Information Systems

WP06 – MV Automation

WP07 - Mini generation and storage (mDER)

WP08 – Energy Efficiency and Demand Response

WP09 – LV Automation

WP10 - Micro generation and storate (μDER)

WP11 - SmartMeters (AMI)

WP12 – Electric Vehicles (G2V)

ICT

GOAL

To deploy an intelligent system for MV automatization with optimal solution -- economic, funcional and operative – for the new network requirements (distributed generation, electric vehicles, storage, renewables integration, etc)

- µStorage
- mStorage
- Public Lighting

PowerLine Communications tests

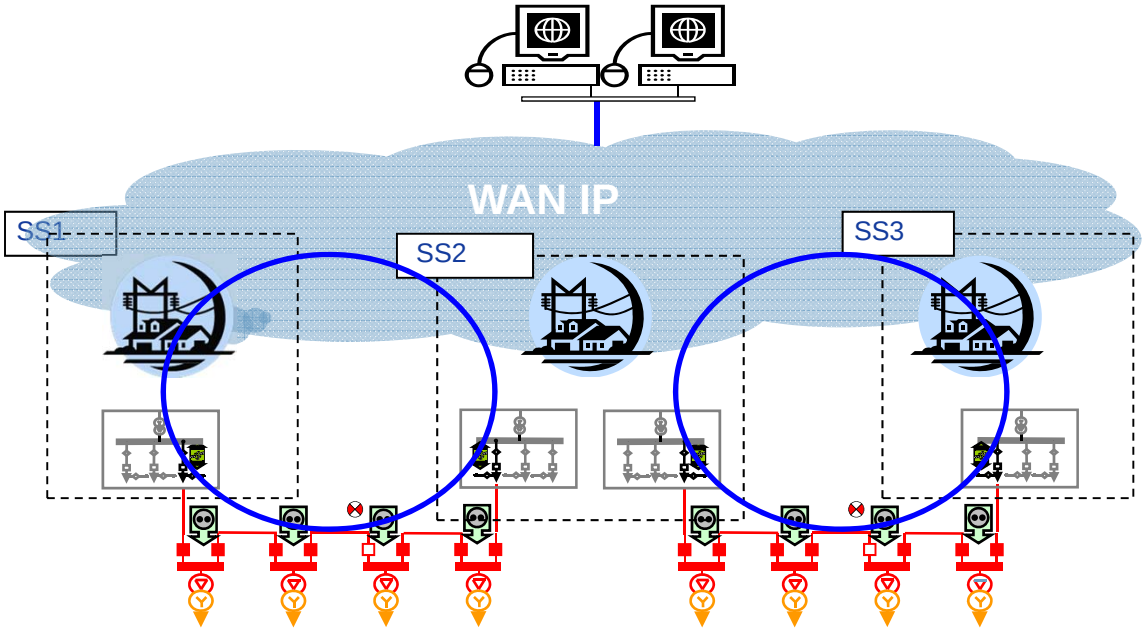
72 **transformers communicated using** PLC, WIMAX **and other technologies**

Redundant **ring architecture**

Advanced **monitoring and control**

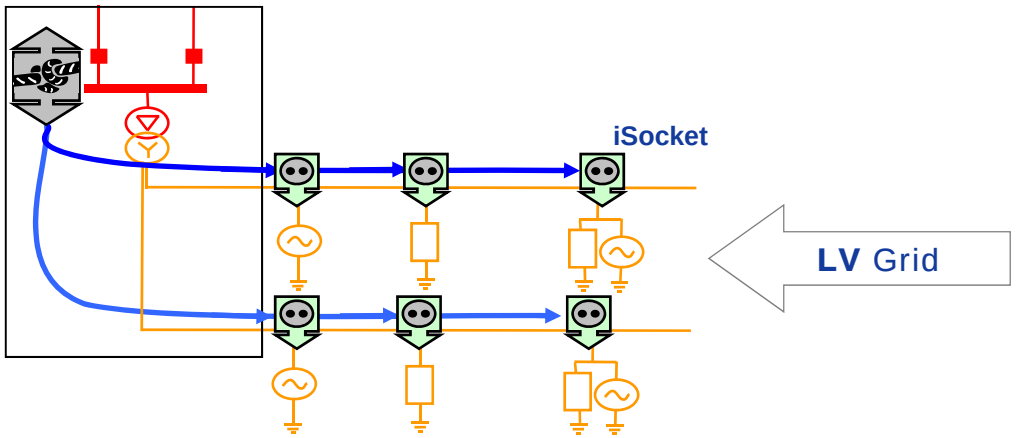
Network Automation

A good part of the telecommunications necessary for this purpose will be PLC though existing lines.
Communications between substations take place through optic fiber**.**

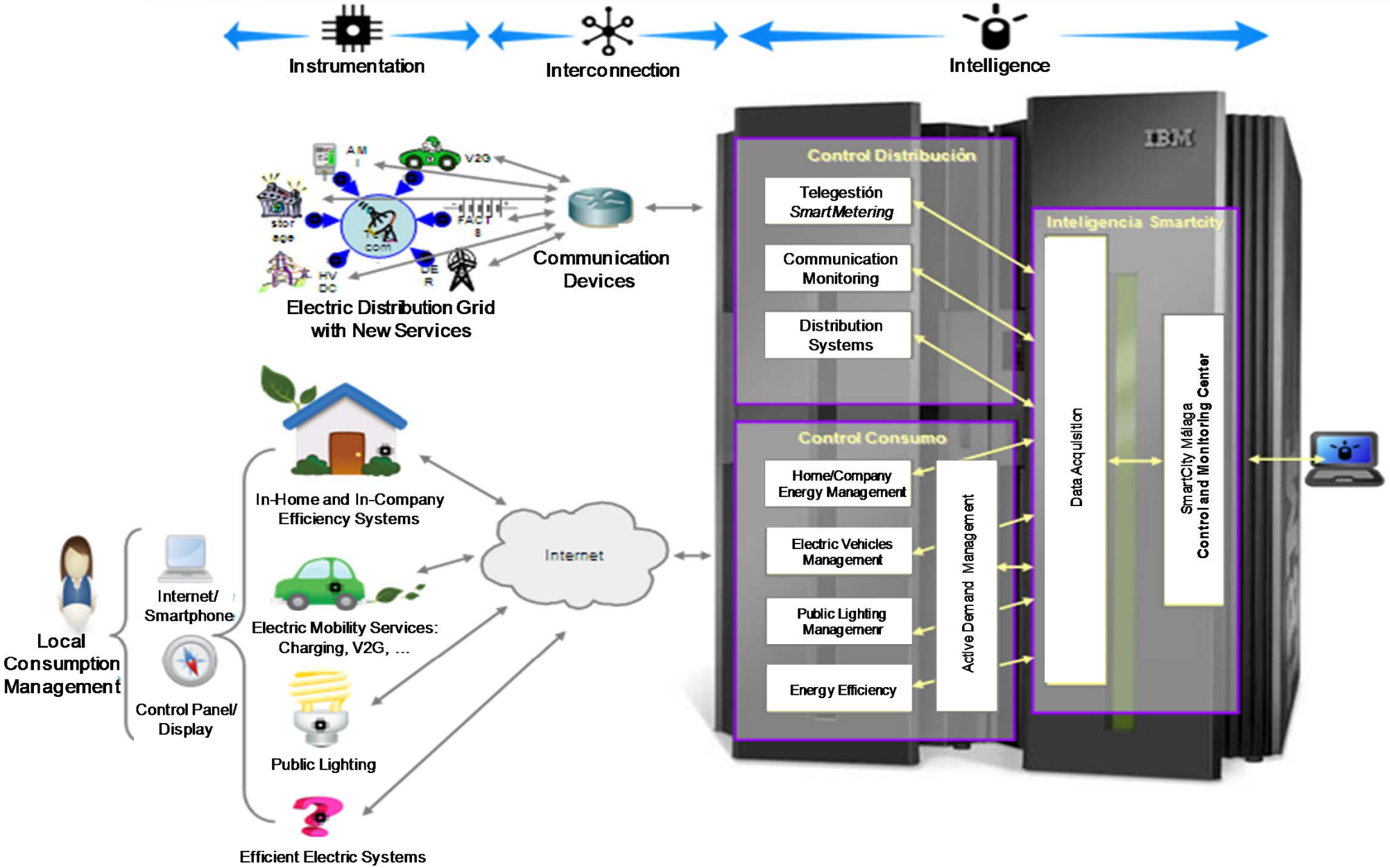


iNode - **Connects the MV with the LV grid . Acts as an autonomous concentrators and sends the control system what happens in the grid.**

iSocket - **Connects to the LV grid to generators, storage and loads, implements functions for local regulation.**



WP05 Systems. Information Technologies



WP07 and WP10 Mini and Micro Generation and Storage

Mini Storage:

Trade Fairs of Málaga:

storage of 106kWh

Micro Storage:

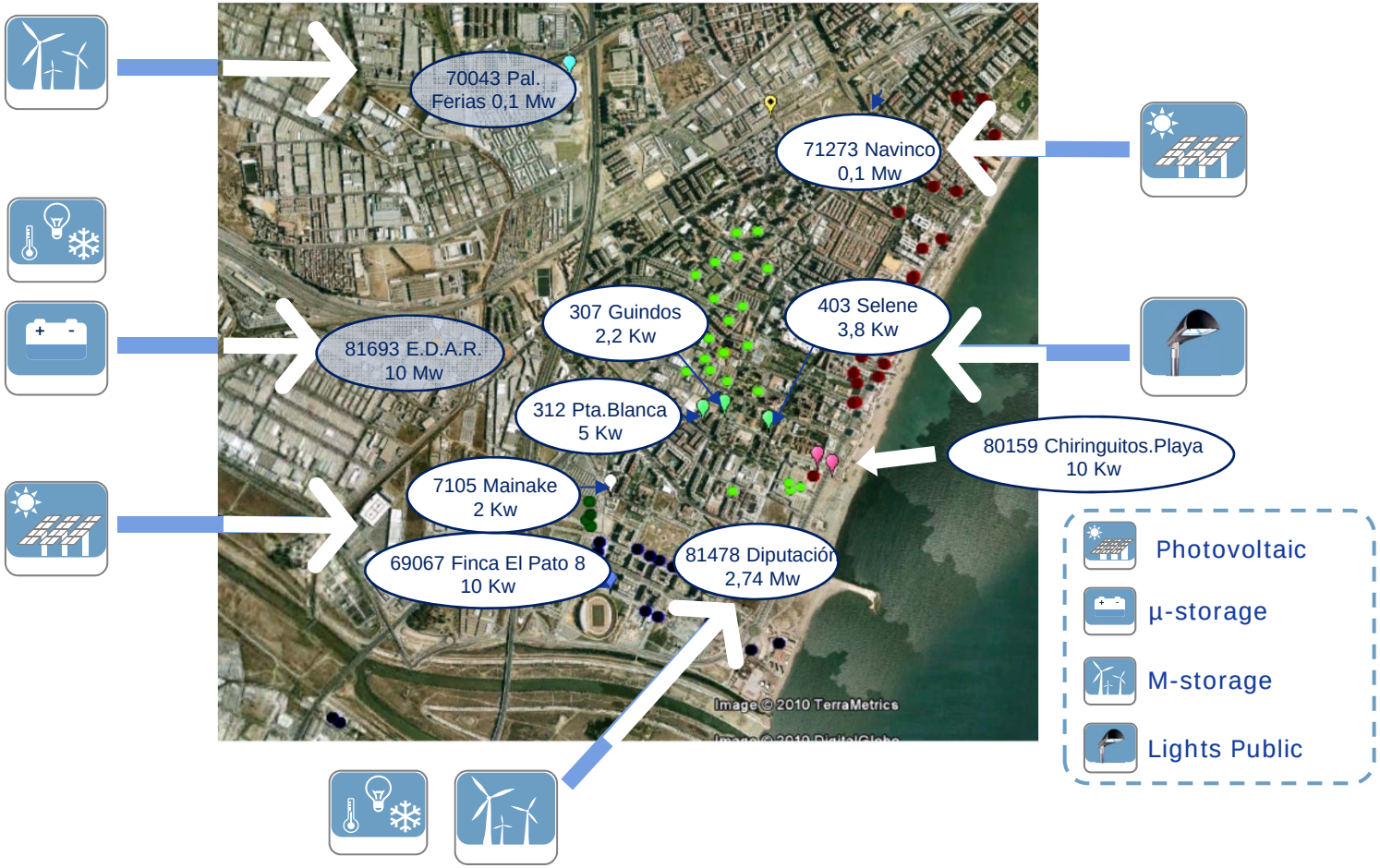
Microgrid with street lighting consumption

24kWh

Generation:

33 kW LV

12,94 MW MV



WP08 Energy Efficiency. Public Lighting

- New luminaries installation:
  - Sodium Technology
    - Placed in Pacífico Street
    - Installation of Flow Regulators and Stabilisers
  - LED and Halogen Technology Lamps
    - Placed in Antonio Banderas Seawalk
    - Point-to-point control
- Installation of new controller cabinets and sensors
- Intensive use of renewable generation and energy storage systems

60 test LED and Halogenuro public lights with remote control

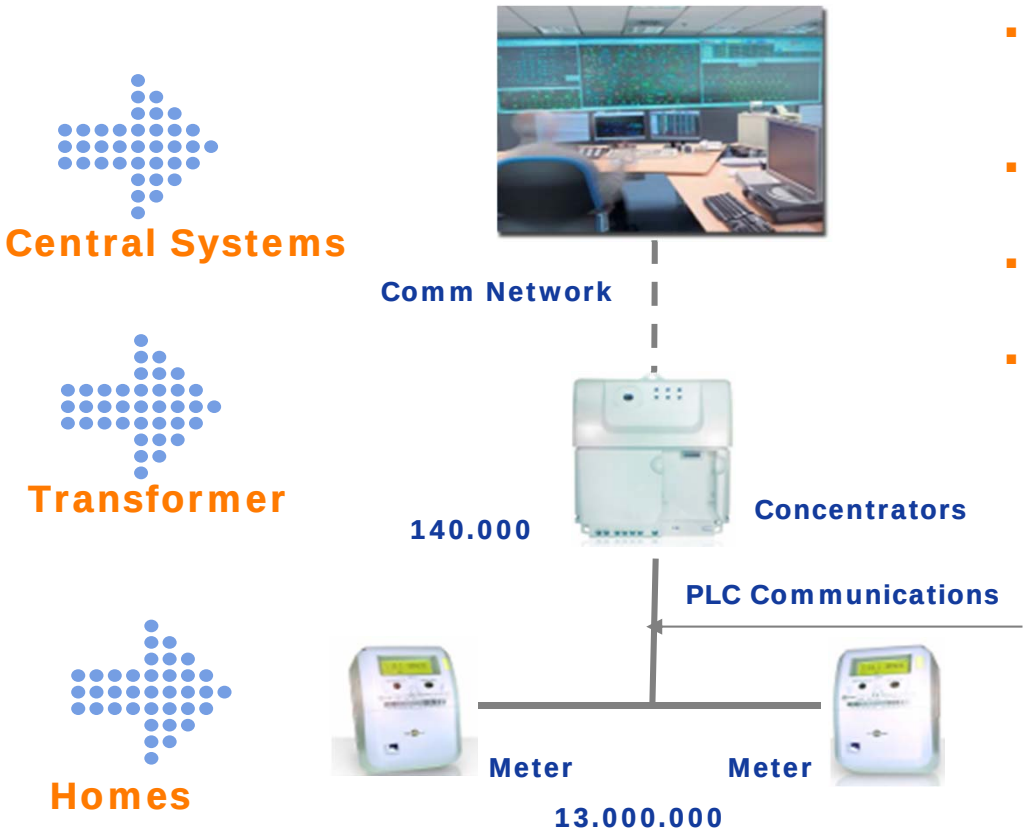
9 lights with wind generation (600W)

10 lights with photovoltaic generation (85Wp)

139 lights points with remote control

12.100 W total controlled power

Architecture adapted to european regulation



Functionalities:

- **AMMS System –** central management and cordination of the whole metering system
- **Electronic meters –** Real-time operation. Allow the energy control and measurement, the remote connection / disconnection, over 6 tariff periods and 2 different contracts
- **Concentrator -** Detects and manages (real-time, fully automated) the new meters conected to the grid
- **PLC-Power Line Communications–** Automatic management of any network change
- **Communication protocol, based in METERS & MORE, with all the reliability of Enel technology and experience.**

Cenelec A Band

PLC of 28.8 kbps operated at 4.8 kbps

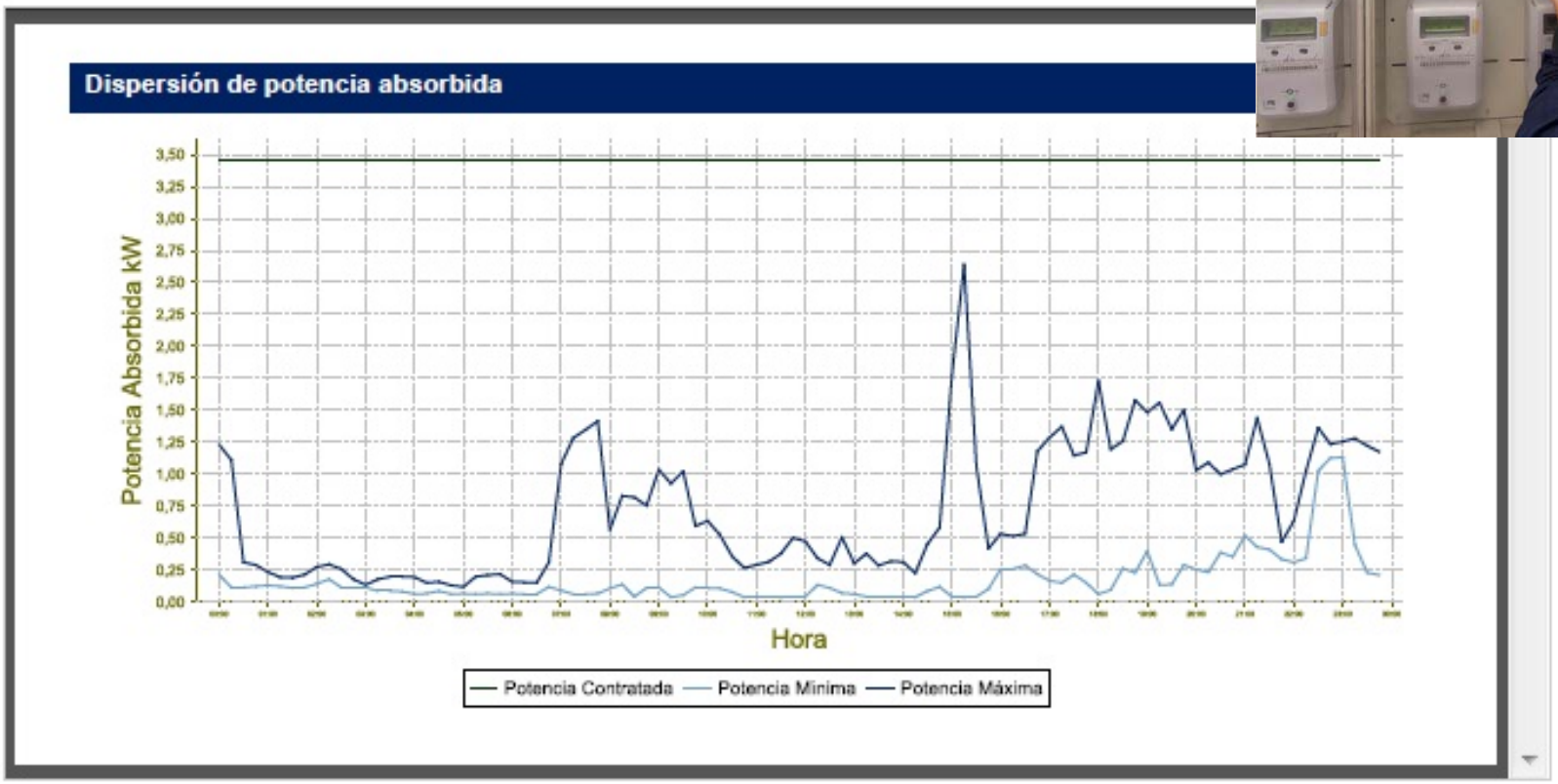
BPSK modulation

Security (AES-128 bits hardware encryption)

Field-proven METERS & MORE PROTOCOL

Available real-time data from the smartmeter:

- **Mean energy consumption**
- **Active-reactive energy comparison**
- **Mean hourly power consumption**
- **Comparison between other clients with similar power factor**



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WP12 Electric Vehicles

4 electric vehicles (BYD, Mitsubishi, …)

2 plug-in hybrids

4 charging posts

Integration with renewable sources

V2G deployed (Microvett)

G4V, Green Emotion, ZEM2ALL…

The V2G concept, Vehicle to Grid, considers the bidirectionality of EV. Connected to network, they can function as:

– Energy sources, when they inject the stored energy in their batteries

– Accumulators, when they charge the batteries with the network energy

Control and Monitoring Center

Visitor attention

Showing diagram and videowall for expositions

Relevant Information

Smartcity Barcelona Project

Barcelona

Fase 1
Short term:

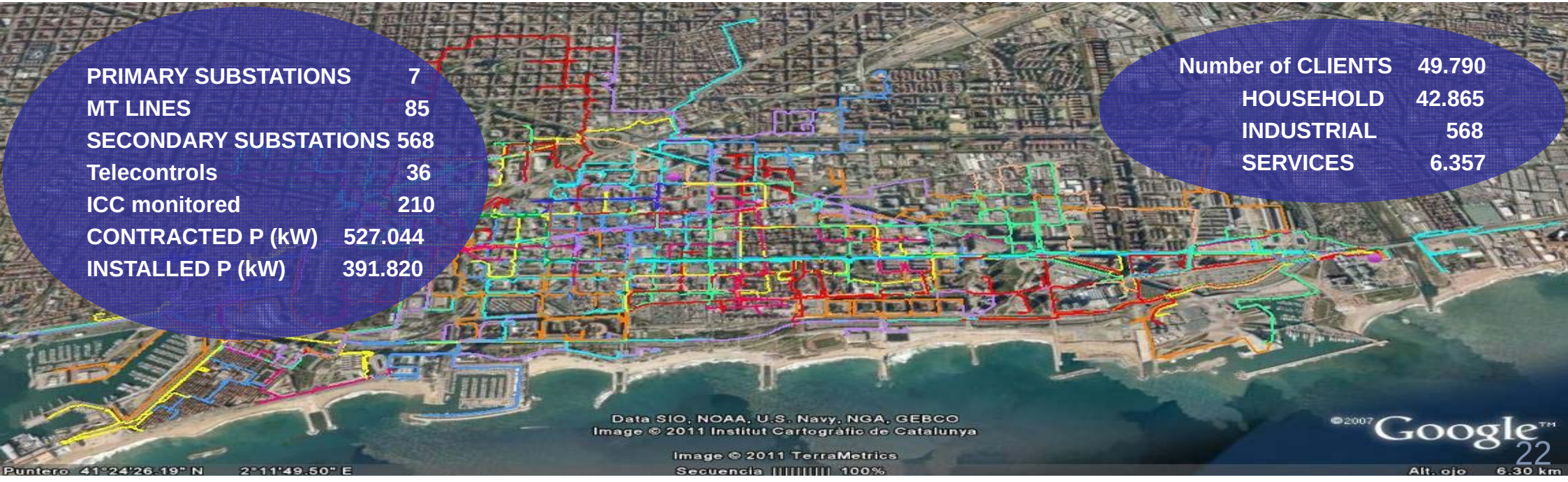
Quick Wins focused; gathering and packing Endesa's (and other partners') already in process, involving the Society, Public Administrations,…

- Telegestión/Telecontrol
- EV charging management
- Efficient public lighting
- Efficiency in buildings and Micro Grids
- Design of an interactive Visitors's Center
- New services for end users

Fase 2
Medium term:

Specifying a Route Map for Smart City Barcelona (EU fundings applied for projects with City Hall and CZFG)

- Technologies, partners, financing
- In development *Fase 2*: focused on systems & grid operation



Smartgrids Service Center

2. C. Objetivos y Actividades principales WG03 Smart Mobility

Infraestructuras y tipología Recarga VE

CARGA RAPIDA

1 PRVE

SUPERFICIE

OTROS

CENTRO OPERACIONES

CARGA NORMAL

56 PRVE

SUPERFICIE

CARGA NORMAL

16 PRVE

PARKING

DER – IREC 22@ MICROGRID

4 PRVE

Comunidad propietarios

Sinergias con Iniciativas Barcelona

Live Endolla't a Barcelona

movele

Green eMotion

CLICK

Barcelona smartcity

Ruta movilidad eléctrica Villa Olímpica

Punto Azul Movilidad

Centro visitas

FERIA DE MUESTRAS

I think CITIES

Smart society for innovative and sustainable cities

Ajuntament de Barcelona

LATAM

Smart Grid projects in Latin America

Bogotà

- ✓**Public Lighting pilot** in calle n° 93 and in the southern part of the city
- ✓**Electric taxi pilot**
- ✓**Network Automation** startup

Santiago

- ✓**Smart metering pilot** **100** smart meters certified by SEC in operation
- ✓**Public Lighting pilot** in Calle Seminario and in Smart City Santiago
- ✓**Electric mobility**
  - successfully installation of the Enel's EMMS system
  - Electric bus pilot
- ✓**Network Automation** project for Smart City Santiago
- ✓**Net metering pilot** for distributed generation integration in the grid

Fortaleza

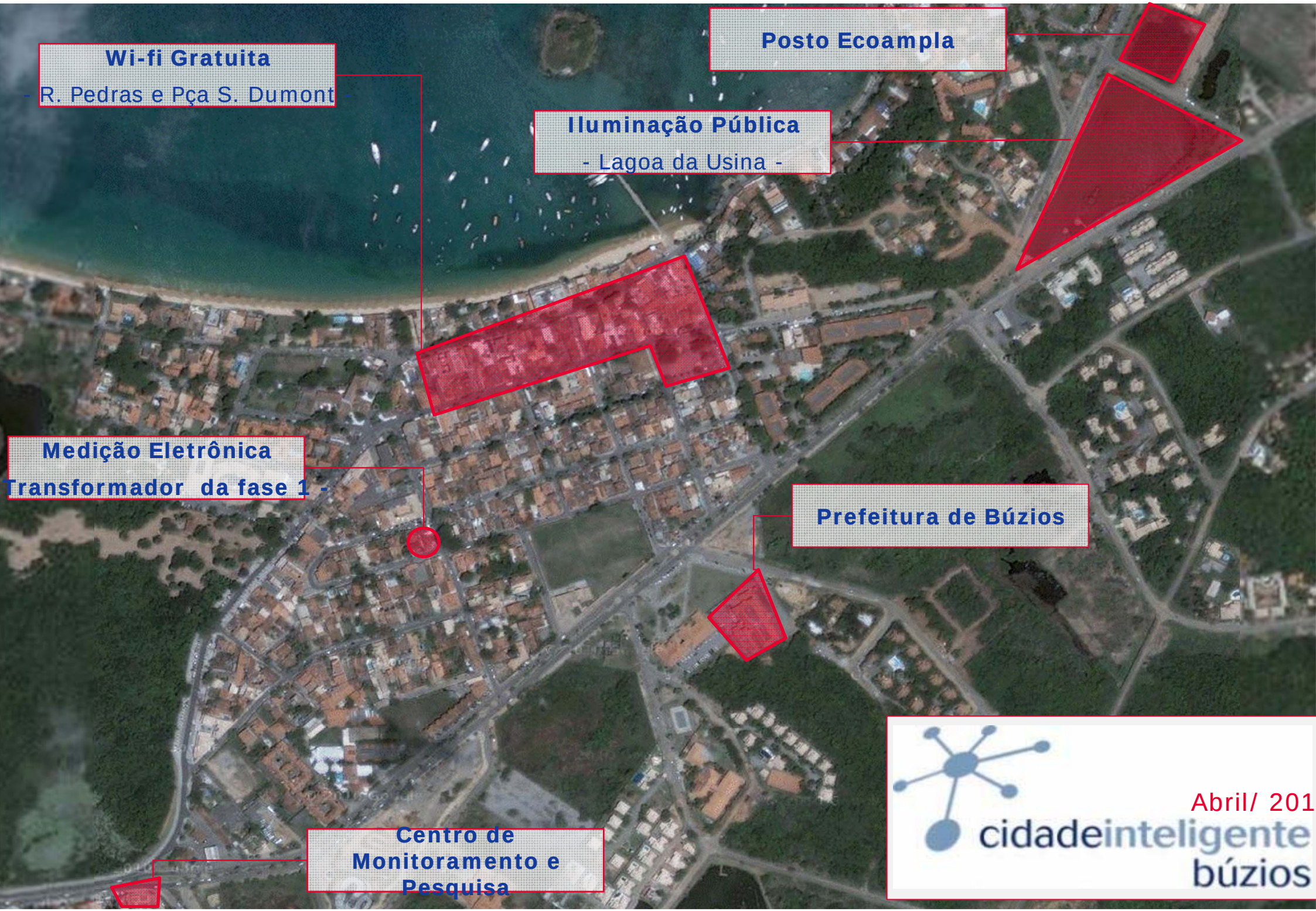
- ✓**Smart metering pilot** **100** smart meters in operation

Búzios

- ✓**First 217 smart meters in operation** (collaboration Enel and Landis+Gyr)
- ✓**Public Lighting** **90** LED Archilede in operation around the Lagoa
- ✓**Electric mobility** 8 charging stations, 4 electric cars
- ✓**Network Automation** project for Cidade inteligente Búzios

Niteroi

- ✓**Smart metering pilot** **100** smart meters in operation


Wi-fi Gratuita
- R. Pedras e Pça S. Dumont -
Posto Ecoampla
Iluminação Pública
- Lagoa da Usina -
Medição Eletrônica
Transformador da fase 1 -
Prefeitura de Búzios
Centro de Monitoramento e Pesquisa
Abril/ 201
cidadeinteligente
búzios

Coleta porta-a-porta em grandes geradores de resíduo (hotéis, pousadas e comercio) em parceria com a Cooperativa local (COCARE)

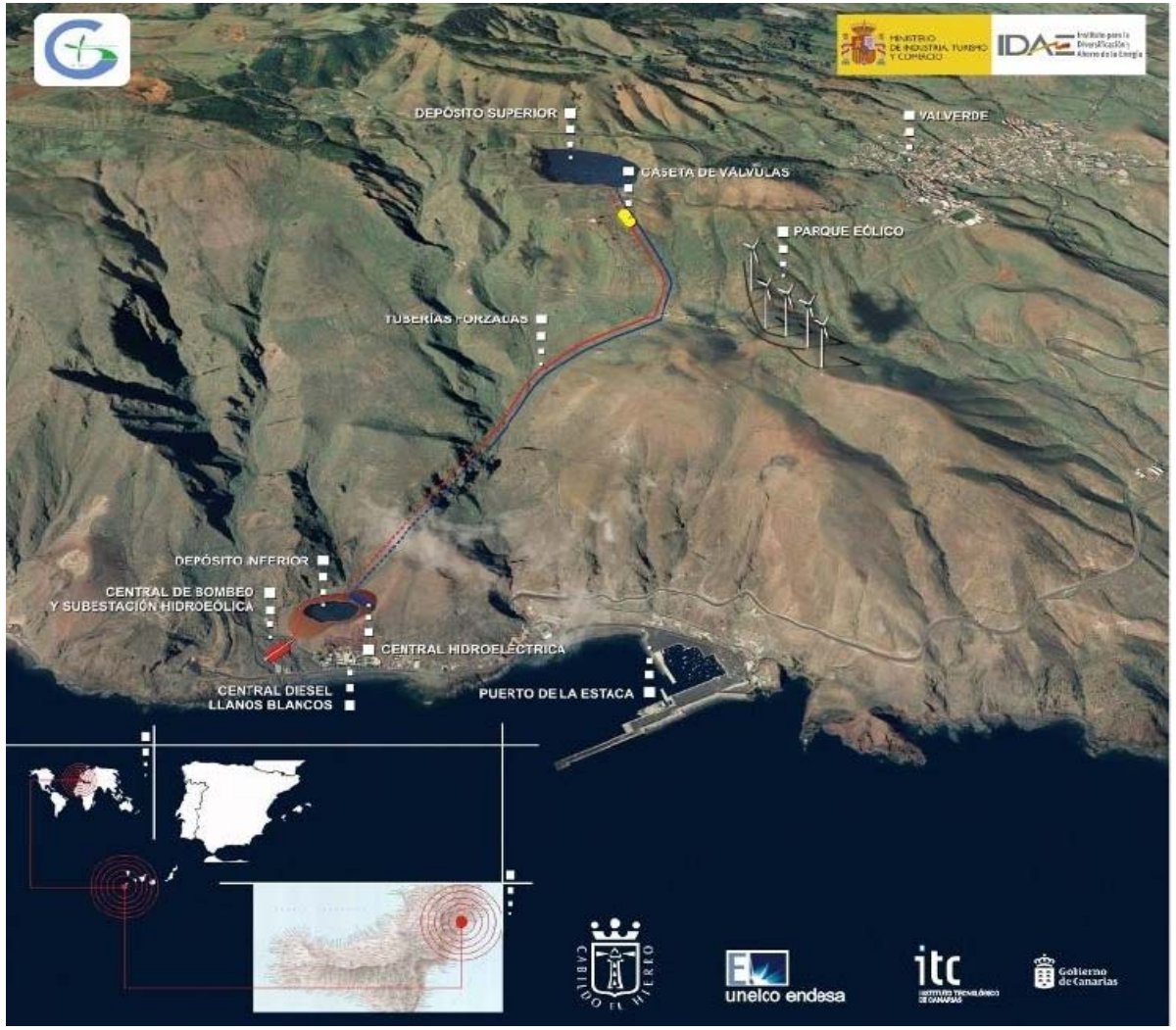
Coleta porta-a-porta de óleo vegetal em Parceria

El Hierro Smart Island Project

Renovables + almacenamiento para máximo nivel de autoabastecimiento

Magnitudes

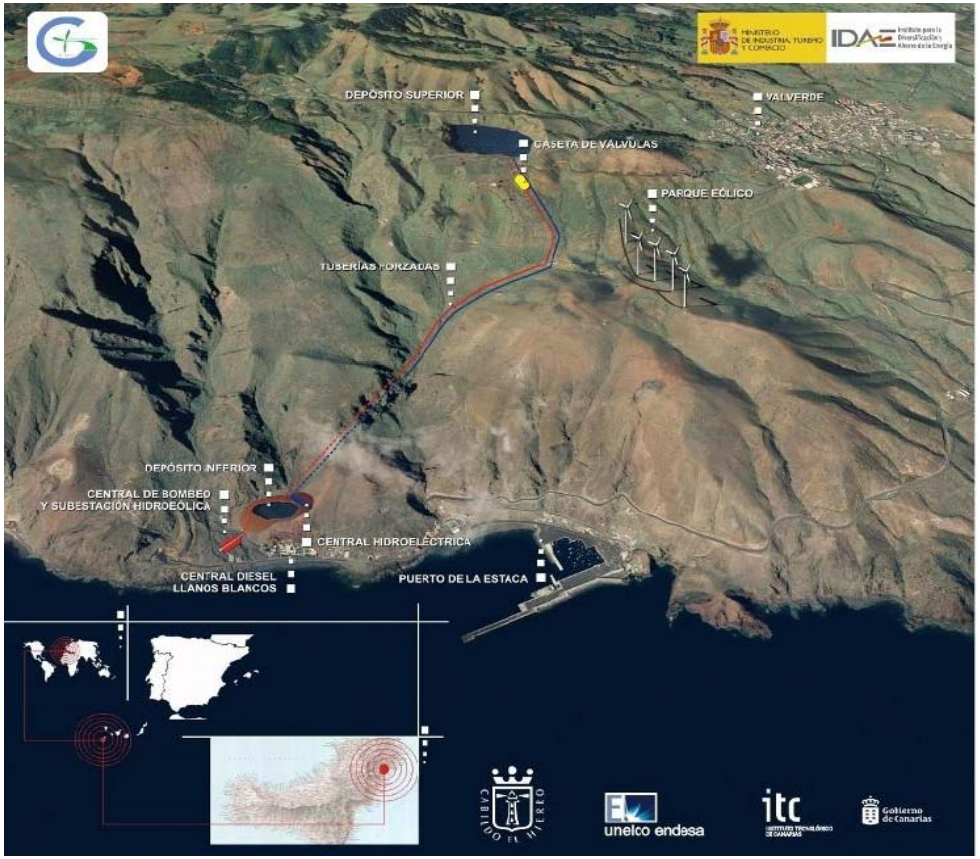
Depósito superior:	**500.000 m³, 714 m altitud**
Depósito inferior:	**150.000 m³, 60 m altitud**
Parque eólico:	**5x2,3 MW, total 11,5 MW**
Generación hidráulica:	**4x2,8 MW, total 11,2 MW**
Estación de bombeo:	**6x0,5 MW + 2x1,5 MW**
Conexión:	**red de 20 kV del sistema insular**
Demanda punta insular:	**7,5 MW**
Cobertura demanda:	**100% potencia, 70% energía**
Emisiones de CO_2 evitadas:	**21.000 toneladas/año**
Presupuesto construcción:	**65 M€**



Endesa ideó e impulsó el proyecto hace más de 20 años. El apoyo decidido del Cabildo, Gobierno de Canarias y la financiación del IDAE lo han hecho viable. Entrará en servicio en 2012.

Vehículos eléctricos en El Hierro

Paso decisivo hacia una isla sostenible, con muy elevado autoabastecimiento y sin CO_2



Esquema de la central de generación hidroeólica de El Hierro.

+

- ✓ **El Hierro presenta atractivas condiciones para que la implantación del vehículo eléctrico sea un ejemplo avanzado de modelo sostenible**
  - **Proyecto 100% renovable, Administración muy comprometida, Plan Director de Movilidad Sostenible, distancias relativamente reducidas, posibilidad de abordar la totalidad de su territorio, etc.**
- ✓ **En todas las islas ENDESA toma iniciativas para impulsar la introducción del VE**

Value Proposal for these cities

- Involves one of the most significant challenges that society will face this century.
- Turns the initiative into an international showplace to display technology relevant to the project.
- Enables experience gaining and the addition of new capabilities which will encourage future research and development.
- Puts in a competitive position both the industry and the national R+D, particularly in Andalucía.
- Others initiatives

Malaga, Barcelona and Buzios have become a window and an international point of reference

It yields knowledge and added value capabilities which will strengthen the development of the industry and the national R+D at the right moment

Grid of today + ICT = Grid of the future

Thank you for you attention

light · gas · people