InovCity em Portugal – Implementar uma Cidade Inteligente...

ANTÓNIO AIRES MESSIAS, Inovgrid, EDP DISTRIBUIÇÃO - ENERGIA, S.A.

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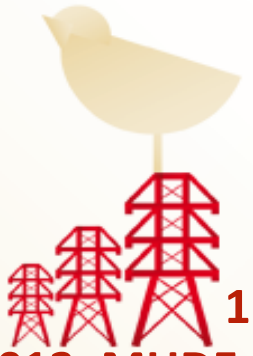

1ª Conferência "Cidades Inteligentes - Cidades do Futuro"

Lisboa E-Nova. 9 de Maio de 2013, MUDE - Museu do Design e da Moda - Rua Augusta, 24 (Lisboa)

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EDP in short… From a local electricity incumbent to a global energy player in Europe, Brazil and USA…

Wind Power

26% of EBITDA
- IPO in Jun-08
- Wind Power: 7.6GW
- # 3 wind operator worldwide (present in 11 countries)
- Listed subsidiary: EDP Renováveis (EDP has 77.5%)

Brazil

15% of EBITDA
- Listed subsidiary: EDP Brasil (EDP has 51%)
- Presence since 1996
- Power generation: 2.0GW (from which 1.8GW is hydro)
- 2 electricity distribution concessions

Portugal

42% of EBITDA
- Privatization in 1997 (IPO)
- Single electricity distributor
- Power generation: 9.9 GW (ex-wind) (from which 5.4GW is hydro)

Spain

17% of EBITDA
- Presence since 2001
- Power generation 3.9 GW (ex-wind)
- # 2 in gas distribution

Key Figures:

- Top World level Electric Sector in Dow Jones Sustainability Index
- #3 World wind energy company
- #1 Europe hydro project (+3,5 GW in development)
- #1 Portuguese industrial group
- EBITDA 2012 :
  - Portugal 42%
  - Other 58%

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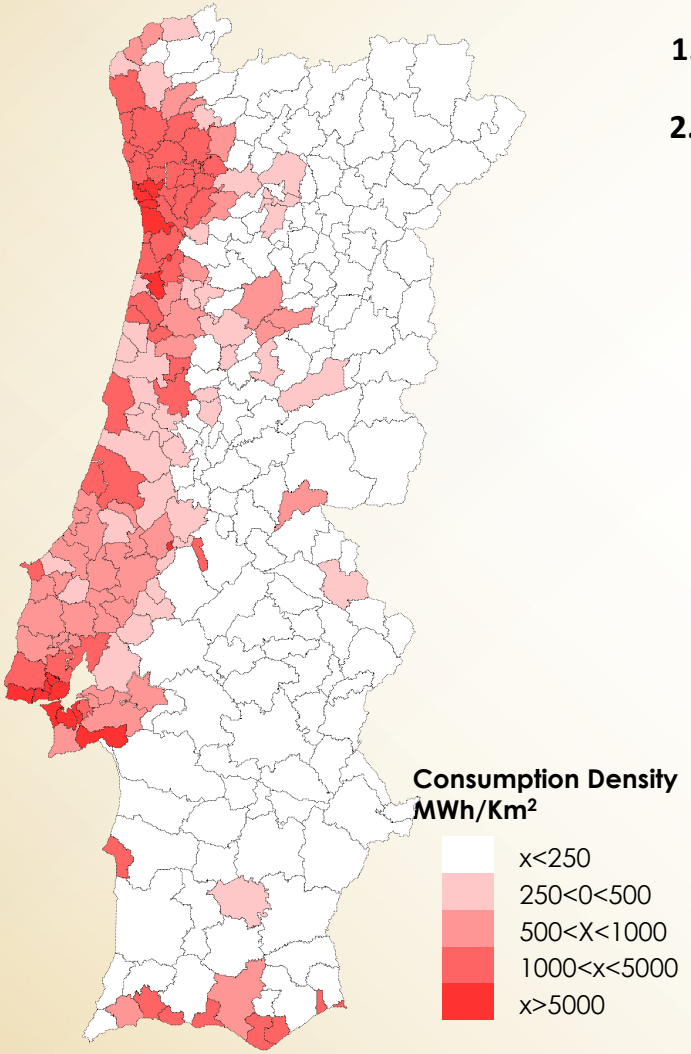
Note: Data as of Dec-12

… EDP Distribuição , Portuguese DSO with over 6 million costumers …

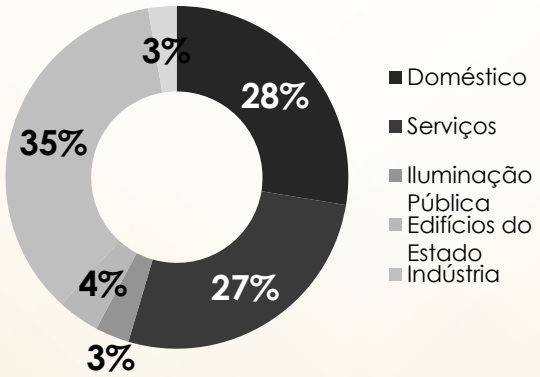
Energy Consumption Density



Main figures (2012)

1.	**Headcount (#)**	**3 528**
2.	**Regulatory Asset Base (M€)**	**~3 000**
	• Substations (#)	414
	• MV/LV Substations (#)	65 161
	• HV/MV Network (km)	83 319
	• LV Network (km)	140 415
	• Customers (thousands)	6 095

Energy Consumption Use (2012)



Key Figures :

- **6 million costumers**
- **44,7 TWh Distributed Energy ;**
- **58 min TIEPI;**
- **1708 Customers/ Employee**

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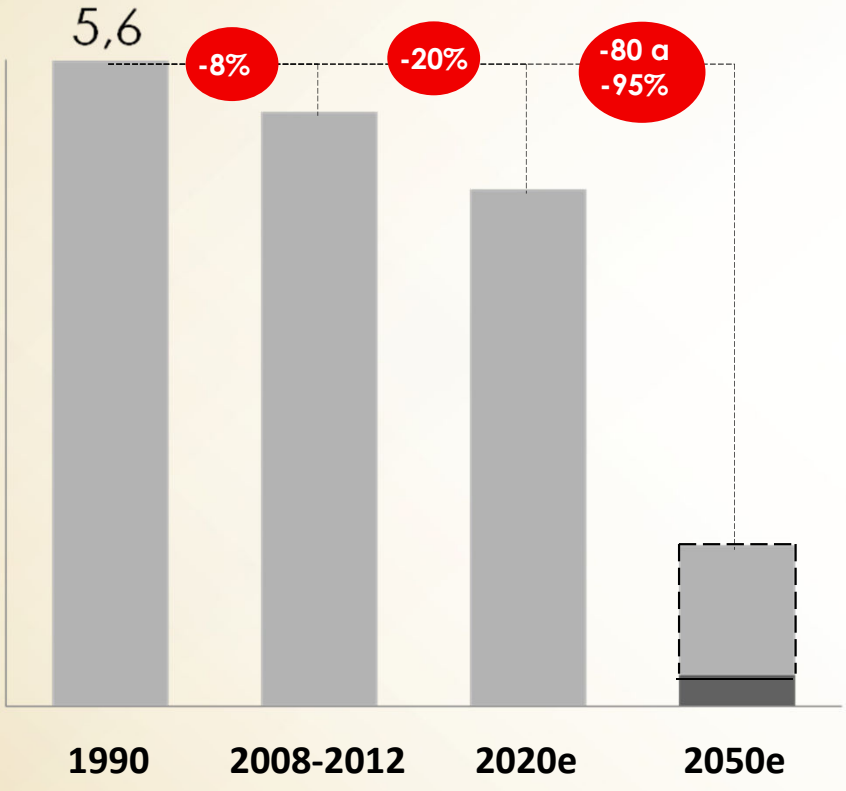
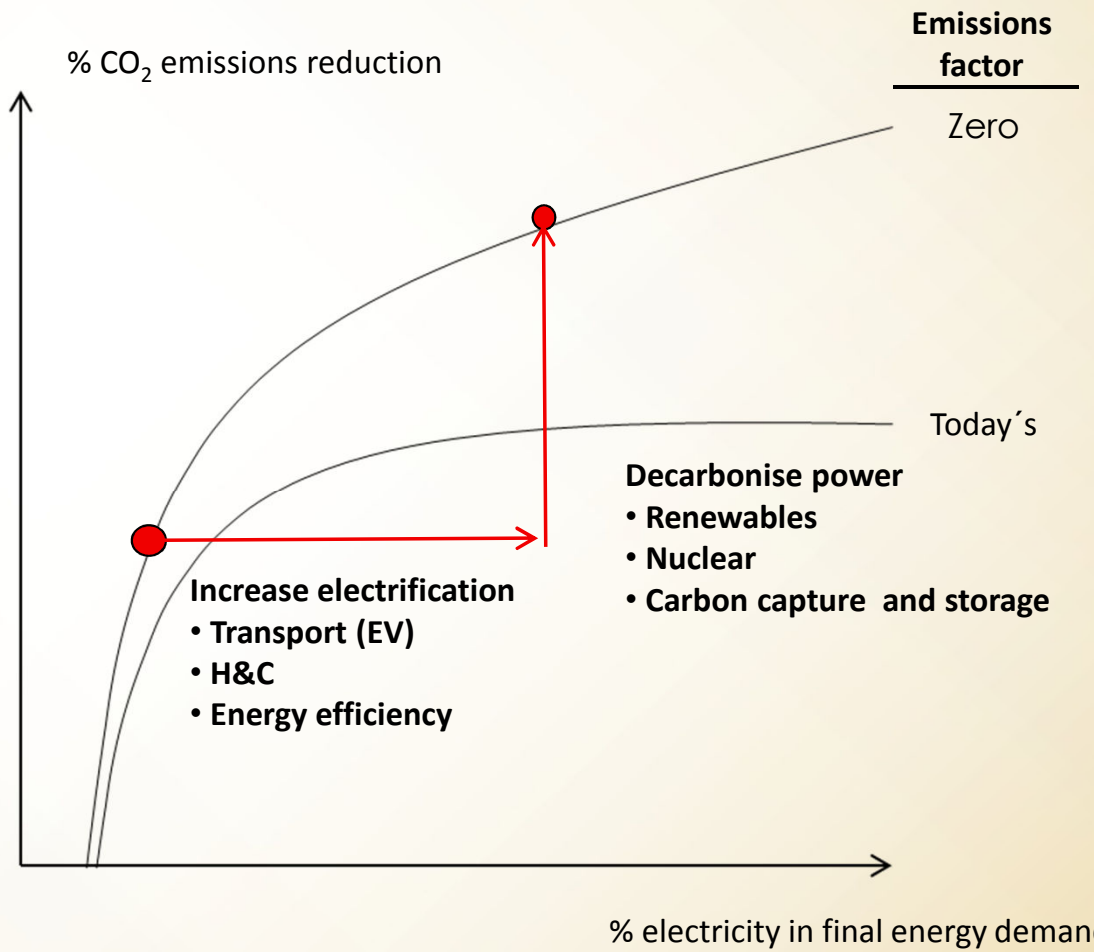
… focus future Services challenges from the electrification increase as key to achieve EU ambitious climate goals...

Emissions targets in EU

$GtCO_2e$



Emissions reduction as a function of the share of electricity in final energy demand



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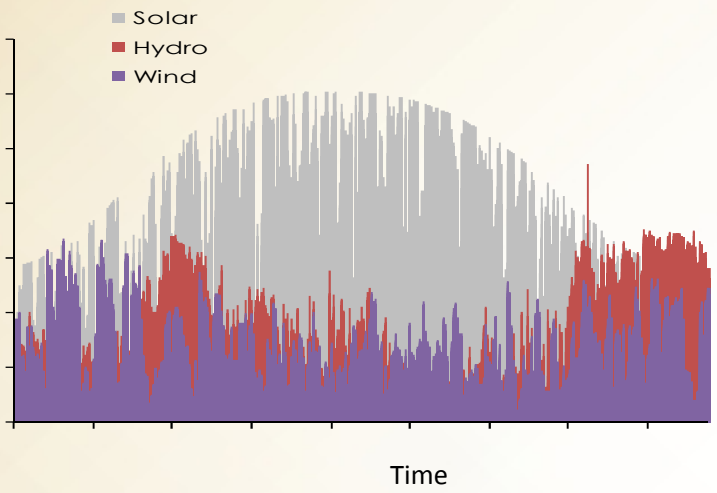
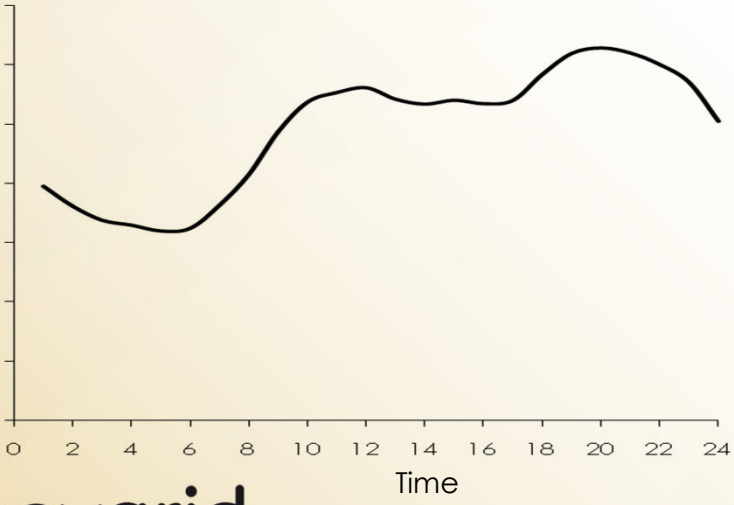
... the Grid will enable increased penetration of intermittent renewables, adding flexibility to the layer between supply and demand...

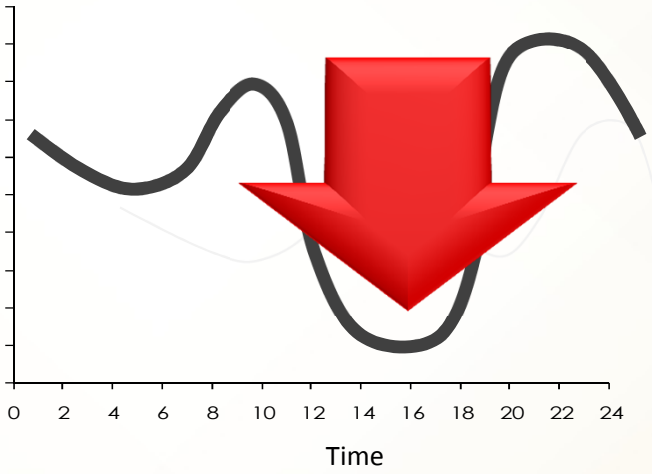
Supply patterns %



Demand patterns GW



Demand patterns with RES GW



Needs:

- Grid Control;
- Generation Mix Management;
- Storage Back-up;
- Energy Pricing;
- DSM/DR;
- ....

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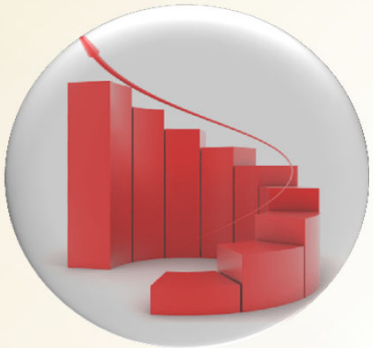
Smart Grids is key for DSO new challenges on distributed generation, energy efficiency increase and electric vehicle integration...

Historical Challenges

Quality of Service



Operational Efficiency

- Supply customers with high quality of service
- Minimize OPEX and CAPEX

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New Challenges

Advanced Metering Infrastructure

Renewables and Distributed Generation

Network automation & sensoring

Smart Grid
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Electric vehicle

Energy efficiency and new business models

New challenges:

- New ways of planning and managing the grid (e.g. DG, bidirectional energy flows...);
- More information to customer energy efficiency;
- New technologies (e.g. energy storage) and new business models (e.g. DSM, dynamic energy prices...);
- EV integration (e.g. V2G, smart charging...)
- ...

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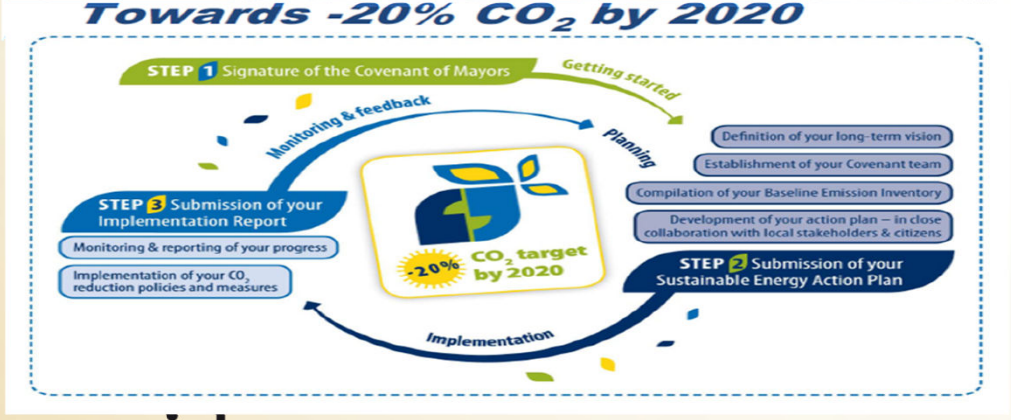
EDP's "smart grid thinking" enables smart cities initiatives aligned with Covenant of Mayors commitment on CO2 reduction...



Smart Cities, EDP and Covenant of Mayors:

- Cities are Europe´s power centres :
  - 3/4 of EU energy consumption in cities
  - 3/4 of EU of CO2 emissions in cities
- EDP commitment on Smart Grids sustainable solutions;
- Coordination with the national electric vehicle charging network;
- Covenant of Mayors commitment on CO2 reduction...

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inovgrid SOLUTION, expected to bring relevant benefits to all Stakeholders in the electrical sector value chain ...

- Improve access to Distributed and Micro-Generation
- Reduce energy costs
- Value added services, tariffs and price plans
- Almost real-time billing and services

Consumer/ Producer

- Provide new services
- Innovative price plans and real-time tariffs
- Improvement on the Customer Relationship Management
- Reduce entry barriers

Electricity Supply

Regulator

- Increase market efficiency
- Continuous reliability and quality improvement
- More accurate information about activities
- New tariffs models

- Reduce meter reading costs
- Reduce network maintenance costs
- Reduce network losses
- Optimized network management and control
- Investment optimization
- Improve quality and reliability of supply

Distribution

National Economy

- Improve energy efficiency
- Promotes penetration of renewable energy reducing dependency on fossil resources
- Develop competency centres and boosts R&D and economy
- Converge to European energy goals

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… demonstrated in a living lab, including Client interaction, Smart Metering, Energy Efficiency, Public Lighting and EV….

EV charging points

Efficiency Case-study with selected Commercial Clients

New products and Services to Domestic Clients

InovCity store

DTC installed in all secondary substations

MicroGeneration integration

Energy Efficiency with Public Lighting

Main attributes of Évora site:

1. Évora municipality:
   - 54 000 inhabitants
   - 1 307 km² of area (urban and rural)
2. The project includes:
   - 30k EDP Boxes and 341 DTCs
   - Integration of IT systems
   - Communications infrastructures
   - New services and products
3. Involvement of the major players of the municipality
4. Coordination with the national electric vehicle charging network

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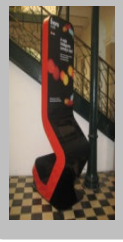
Developing a strong involvement of local stakeholders and communities …

Presence in the local press

Client research and Social studies



Involvement of the Town Hall and other local public Authorities

Energy Bus in Évora

Mailing and information to Évora Clients

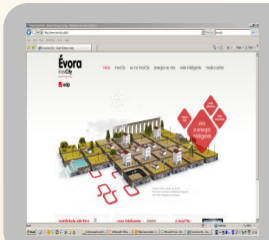
Monthly Newsletter to all Energy related professionals in Évora region

3D Model at InovCity Store in City Centre

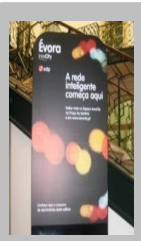
In-home displays in stores at the historical centre

Collaboration with Évora University

Test of new products and services



InovCity website and local social networks and blogs



Smart Grids conferences and meetings in Évora

Main initiatives:

- Client research and Social studies ;
- Involvement of the Municipality and other local public Authorities ;
- Collaboration with Évora University ;
- Coordination with the national electric vehicle charging network ;
- ….

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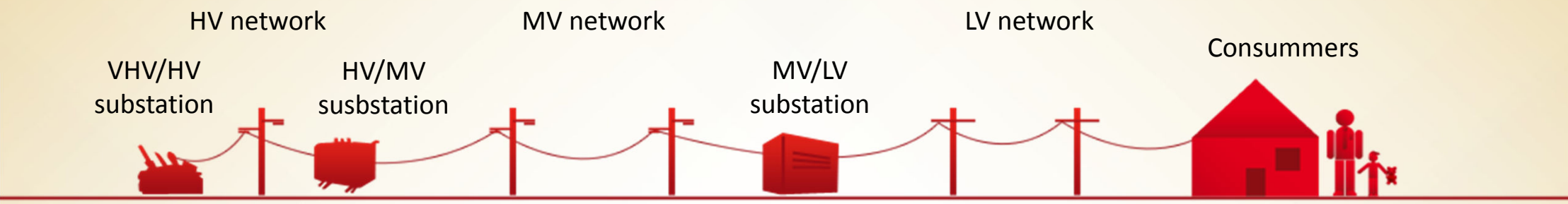
inovgrid, EDP Distribuição is building a smart grid with an integrated approach , touching different areas to this change…




Head-end systems

Wide area network
WAN


DTC

Local area network
LAN


EDP Box

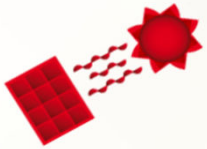
Home area network
HAN


System integration and cybersecurity


DG and storage


MV automation and telecontrol


Remote public lighting metering and management


Microgeneration integration


New tariffs, products and services


Information management and data mining


New tools for smarter network management


Improved network operation and quality of service


GIS and Work Force Management


EV charge network


Energy efficiency services

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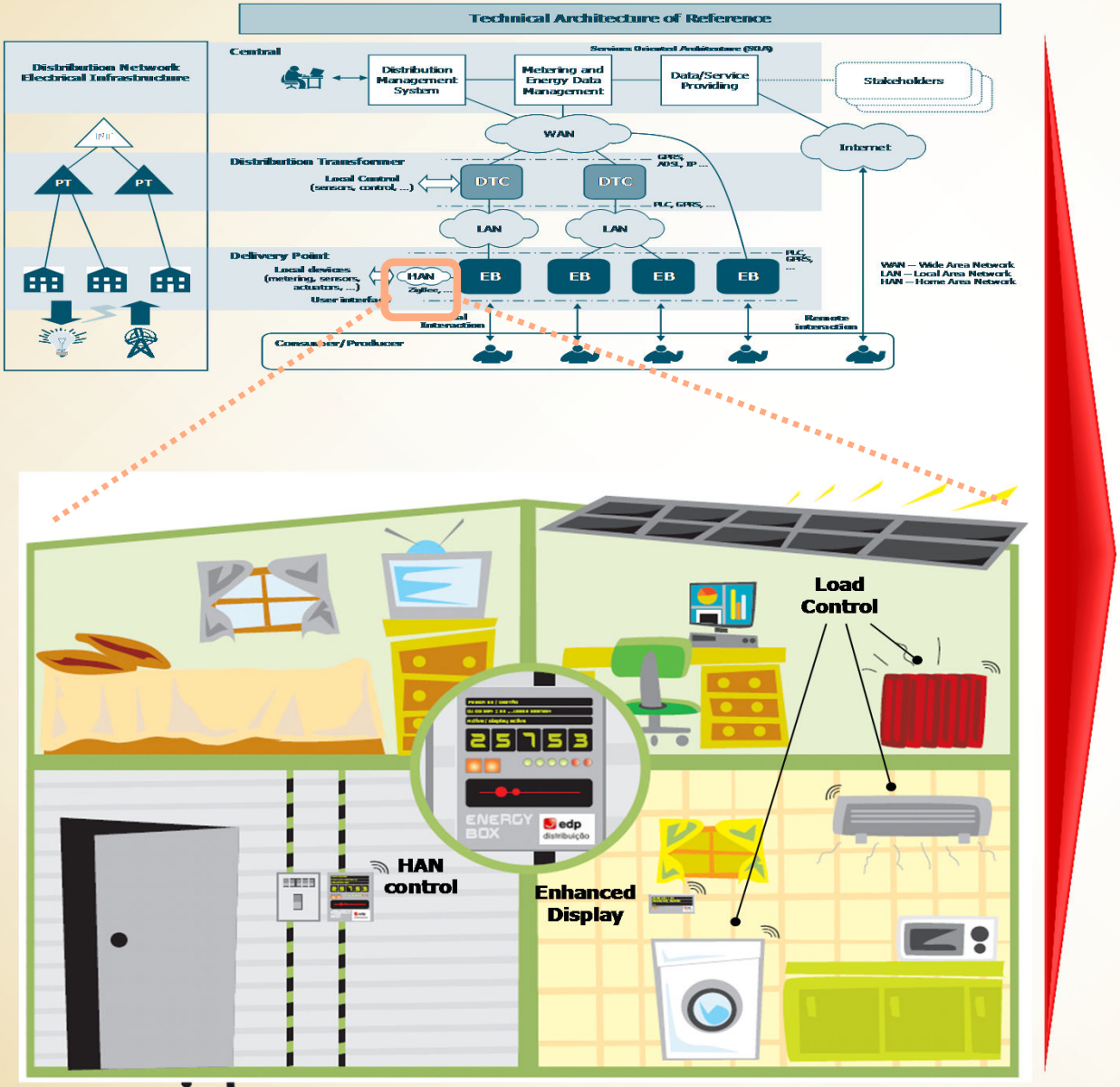
… improving communications at the delivery point with a Home Area Network (HAN) integrated with the EDP Box…



Home Area Network (HAN)

HAN is the communications network at the delivery point, controlled by the EDP Box (EB), wireless or PLC, with objectives:

- to facilitate the communication between energy devices for enhanced network functionality (ex: load control devices, for Demand Response implementation)
- to offer value added services to the customer (ex: enhanced display in convenient location, home automation)

HAN will include an optional local RF interface that enables a friendly and flexible interaction between EB and consumers using a mobile-phone, PDA or laptop:

- access to energy consumption
- view load profile
- access network operator messages
- …

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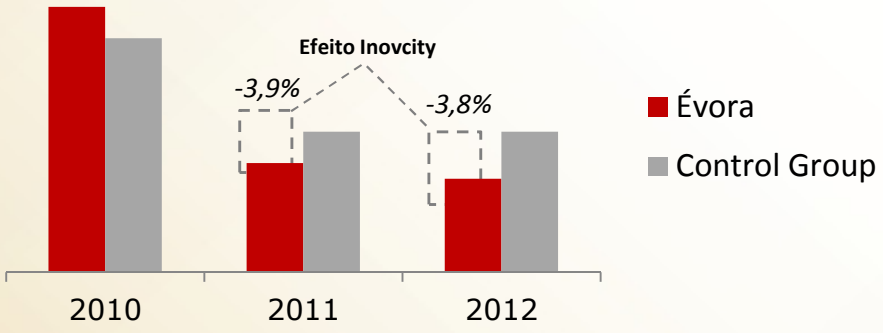
Significant energy efficiency gains demonstrated by smart grids and customers interaction…

1 Efeito Inovcity (população de Évora)

- Redução do consumo[1] em **3,9%** em comparação com o grupo de controlo (a);
- Facturação com base em consumo real; Acesso permanente ao histórico de consumo na portal EDP Online; Exposição à comunicação do projecto e a recomendações genéricas de eficiência energética.
- Os resultados parecem ser persistentes[2].

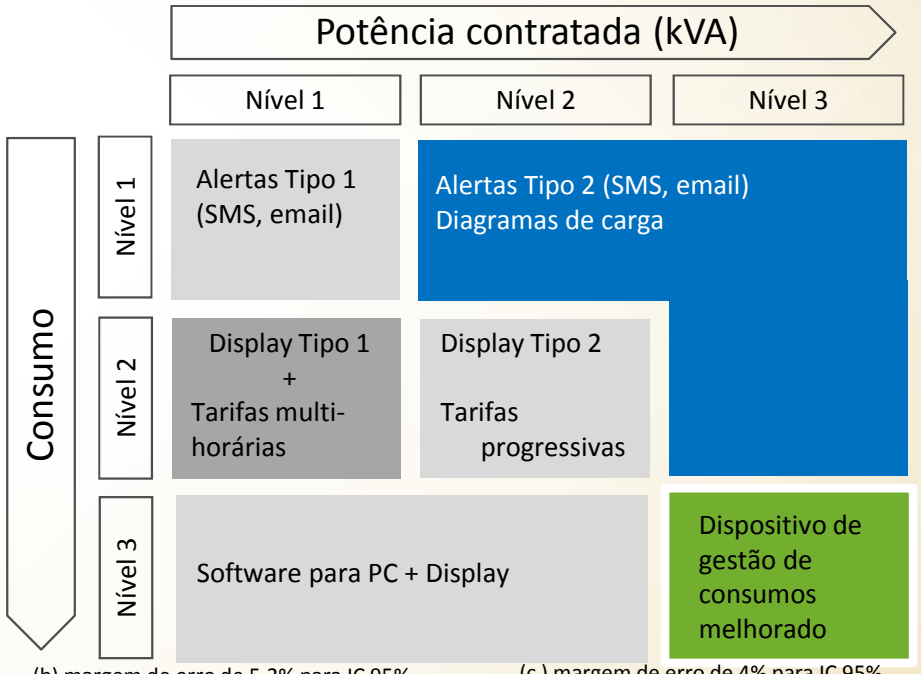
Evolução do consumo por cliente entre 2010 e 2012[1]



(a) margem de erro de 2,1%, para um intervalo de confiança (IC) de 95%

2 Novos produtos/serviços (grupo de teste)

- Redução do consumo[3] em **5.3%** para o grupo de clientes com acesso a relatórios, alertas e tarifas especiais (b);
- Redução do consumo[3] em **6.6%** para o grupo de clientes com acesso a displays/sistemas de monitorização (c).



(b) margem de erro de 5,2% para IC 95%

(c) margem de erro de 4% para IC 95%

(1) Resultados registados entre Março de 2011 e Fevereiro de 2013.

(2) De 2010 para 2011 houve um decréscimo generalizado do consumo de electricidade, provavelmente associado á deterioração das condições económicas (efeito em princípio filtrado pelo uso de um grupo de controlo).

(3) Resultados da comparação 2012 vs. 2010.

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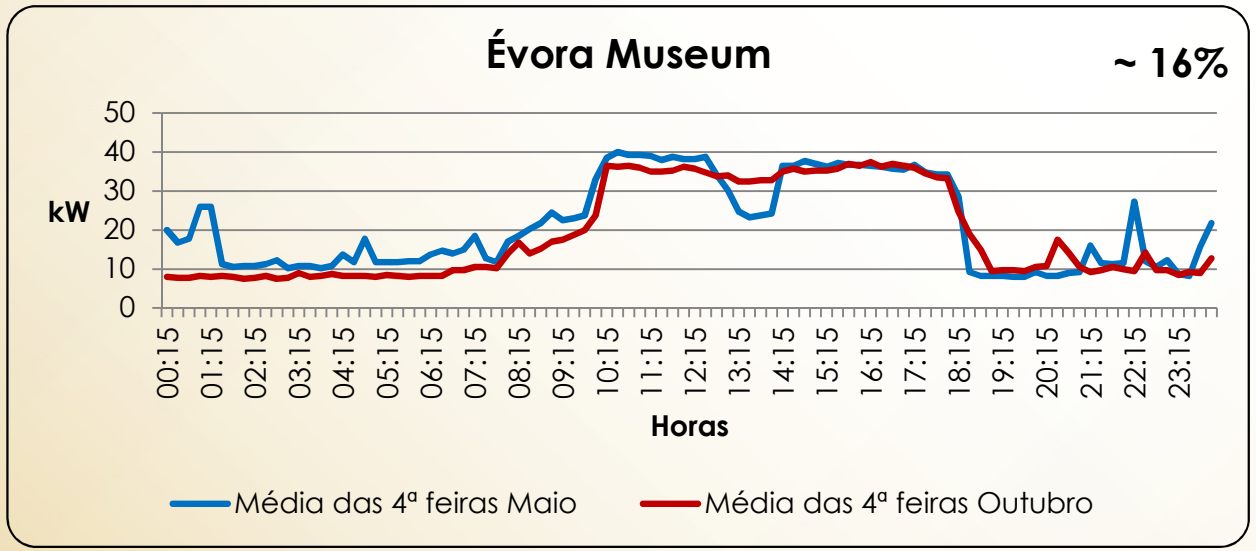
Significant energy efficiency gains with high consumption LV customers interaction …


diário do SUL

Leitura dos gráficos
permite uma maior racionalização do consumo eléctrico

- "Data coming from EDP, particularly **the visual information**, has been **extremely useful** and interesting for all the Museum team"
- "There was a major concern of **involving all the 17 people** that work here, and making them aware of the energy consumption reduction topic"
- "We **started by solving the night problem**, (…) we chose to switch on the lights step by step, instead of all at the same time, when we needed to walk around the museum at night."
- "Natural light in the building was maximized in order to **reduce consumption**"



Main Findings:

- **Energy efficiency** gains between **6% and 24%,** in high consumption LV consumers;
- Small reductions in consumption altogether have a large impact in the monthly bill for high consumption LV customers;
- Close interaction with consumers (in particular the facilities manager) is key to ensure effective consumption reduction, as only 11% of them accessed the online web service;

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EDP is also testing new public lighting solutions including LEDs, regulators and remote management systems...

Public lighting in the InovCity:

- Public lighting will have improved efficiency;
- Replacement of traditional lights by LEDs in some central places;
- Introduction of light regulators and presence sensors;
- Introduction of more flexible public light control, operated by the customer (municipality) via Web portal ;
- Special care in historical places (world heritage)...

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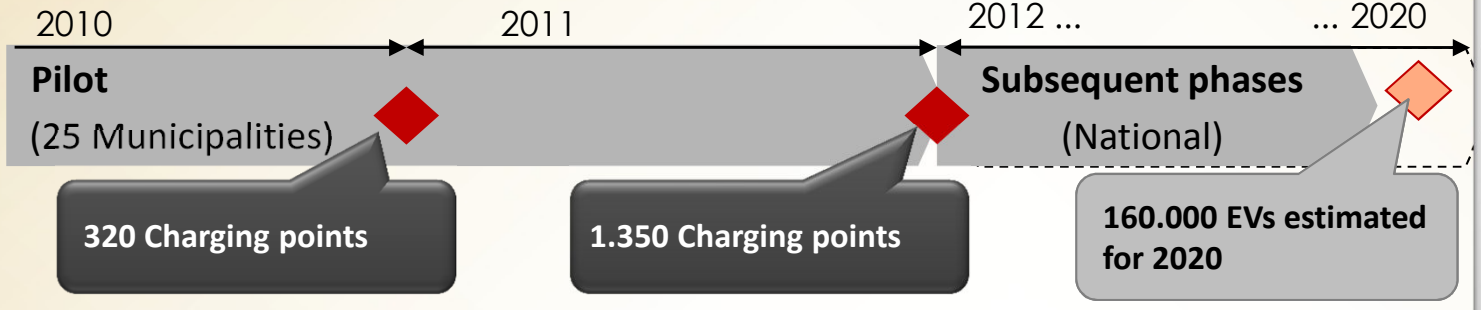
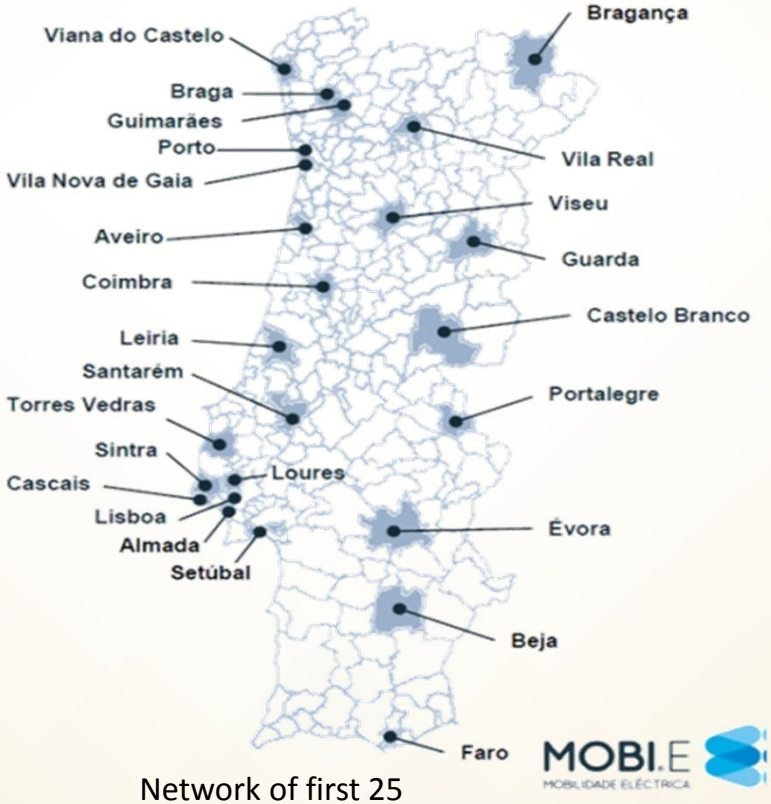
inovgrid platform supports other infrastructures such as Electric Vehicle (EV) charging points, integrated in the Grid …

National EV integration timeline



Inauguration of first CP, 29th of June 2010



Network of first 25 municipalities

inovgrid and charging infrastructure :

- 25 Cities pilot group;
- About 20 charging points in Évora;
- EVs and plug-ins, decide when to buy or sell electricity according to the "spot" price of energy;
- …

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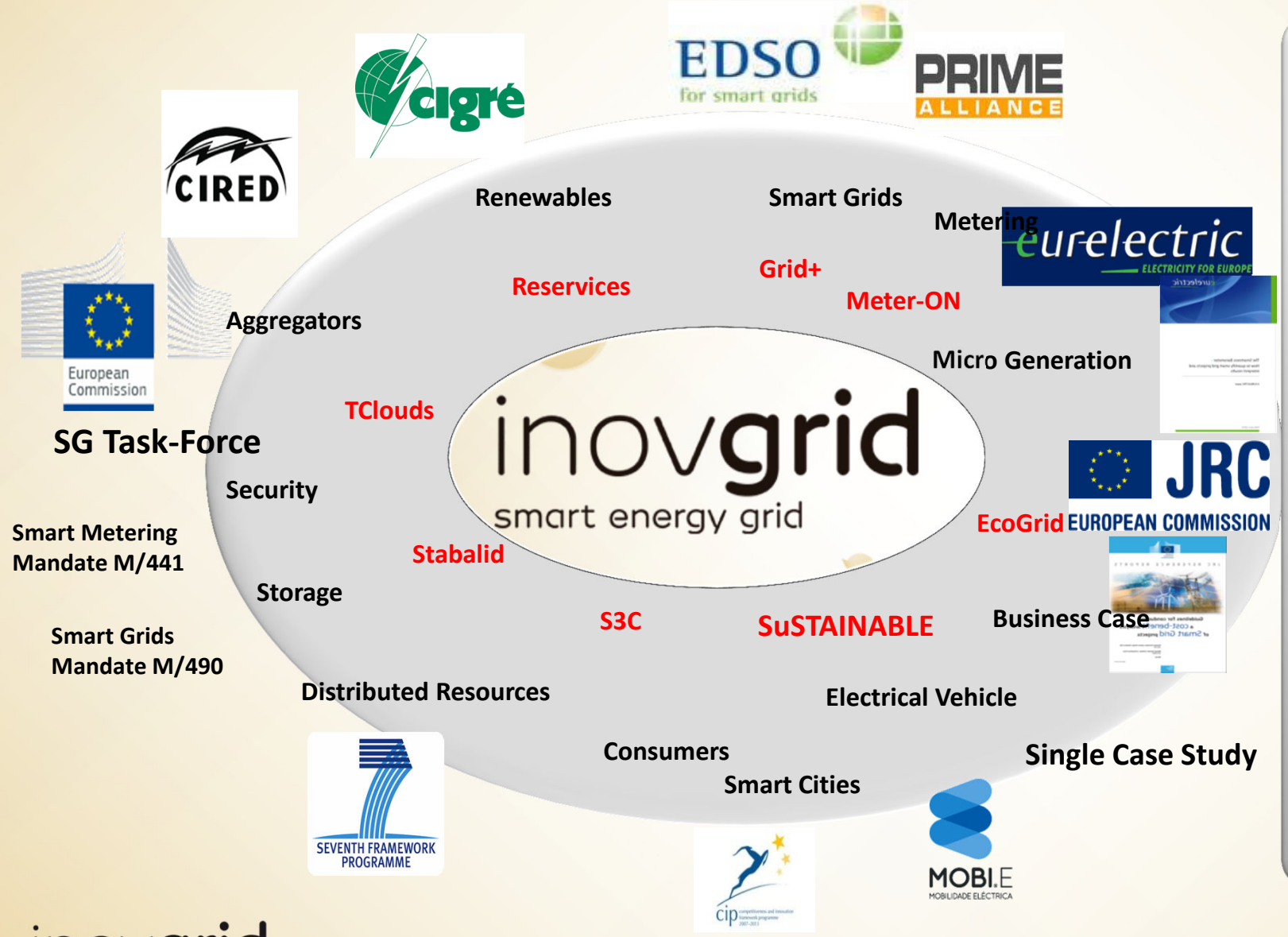
… sharing and replicating knowledge and solutions, actively participating in several international events and European projects, …



European projects:

- SuSTAINABLE,
- EcoGrid,
- Reservices,
- Grid+,
- TClouds,
- ….

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InSMART is an European FP7-ENERGY-SMARTCITIES project, to be started on 2013 with 3 years duration , with EDP participation …

Consortium Partners

Nottingham, Trikala, Évora and Cesena

- **Project Title**: Integrative Smart City Planning
- **Call**: FP7-ENERGY-SMARTCITIES-2012
- **Topic**: ENERGY.2012.8.8.1 Strategic sustainable planning and screening of city plans
- **Duration**: 36 months
- **Budget**: 2.6M€ (EC 2M€)*
- **Objective**:
  - Provide a comprehensive understanding of the energy system of each city
  - Identify the optimum mix of measures and interventions towards sustainability
  - Pave the way towards implementation of the sustainability measures
  - Promote integrated sustainable city planning
- **InSMART concept**: brings together cities, scientific and industrial organizations to establish and implement a methodology for sustainable planning addressing the current and future city energy needs.

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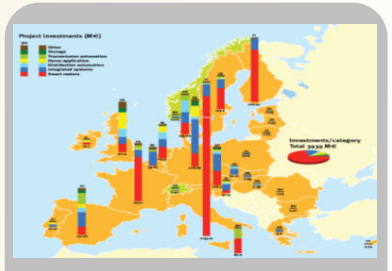
Inovgrid has received visits from more than 30 nationalities and more than 1000 visitants …

World wide visitants…

ERSE - Prince Charles- China Three Gorges-República Checa-Lógica-Colômbia-Eandis - Bandeirante-Corpoelect-DR ENER CE-Zhuai-França-Roménia-Ilhas Montanha-Macau - Fleming-DRC -Universidade Unioeste-Fundação Getúlio Vargas- Japão-Indonésia-ADREM-ERDF-ABDI-Sentec-Basildon Council-Tuas Power-Australia -QREN – Novabase-Mozambique-Singapure……

inovgrid, track record…



2007 — Inovgrid Consortium started

2011 — InovGrid selected as the single case study

2012 — JRC / Eurelectric InovGrid Reports

2012 — "Utility of the year Award 2012"

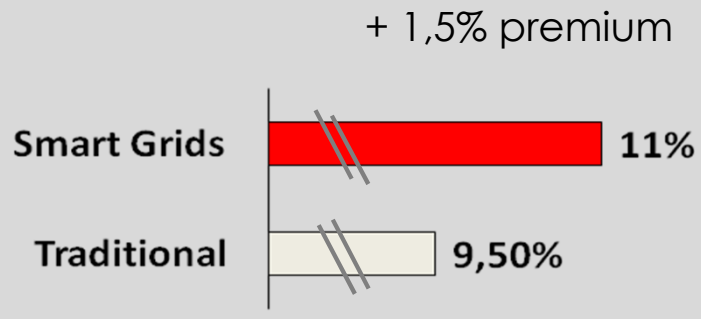
2013 — EEGI Core Project LABEL

JRC report on "Guidelines for conducting a cost-benefit analysis of Smart Grid projects" http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/25731/1/2012.2783-jrc_rr_cba_for_smart_grids_%28online%29.pdf"

"The Smartness Barometer – How to quantify smart grid projects and interpret results" http://www.eurelectric.org/media/27000/the_smartness_barometer_cba_final-2012-030-0197-01-e.pdf

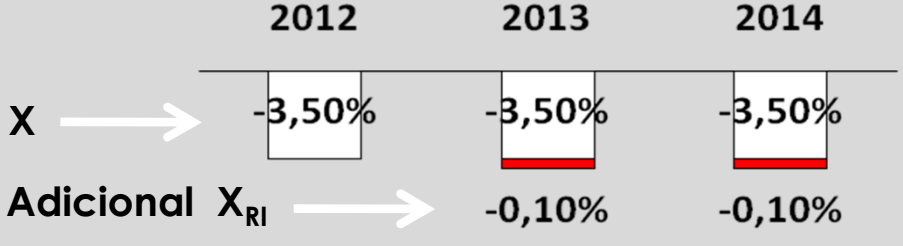
"innovative" smart grid investments incentive , higher returns in exchange for technological and business risk, introduced by Portuguese regulator (ERSE)…

Remuneration Rate with risk premium over "traditional" investment:



EDPD assumes technological risk (equipment substitution, obsolesce,…)

Additional OPEX efficiency targets included in RPI-X formula:



A first outlook of regulatory environment relating smart grids investment was already published for 2012 - 2014, introducing incentive to "innovative" smart grid investment (with a risk premium over the "conventional" investment remuneration rate)

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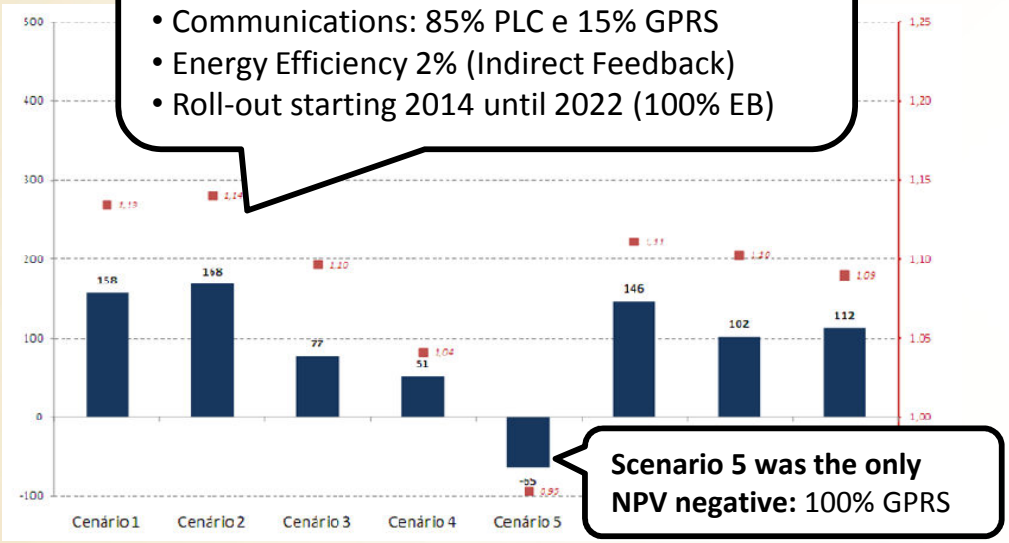
… presented a cost-benefit evaluation with positive societal NPV, aligned with EDP Distribuição assessments, in June 2012…

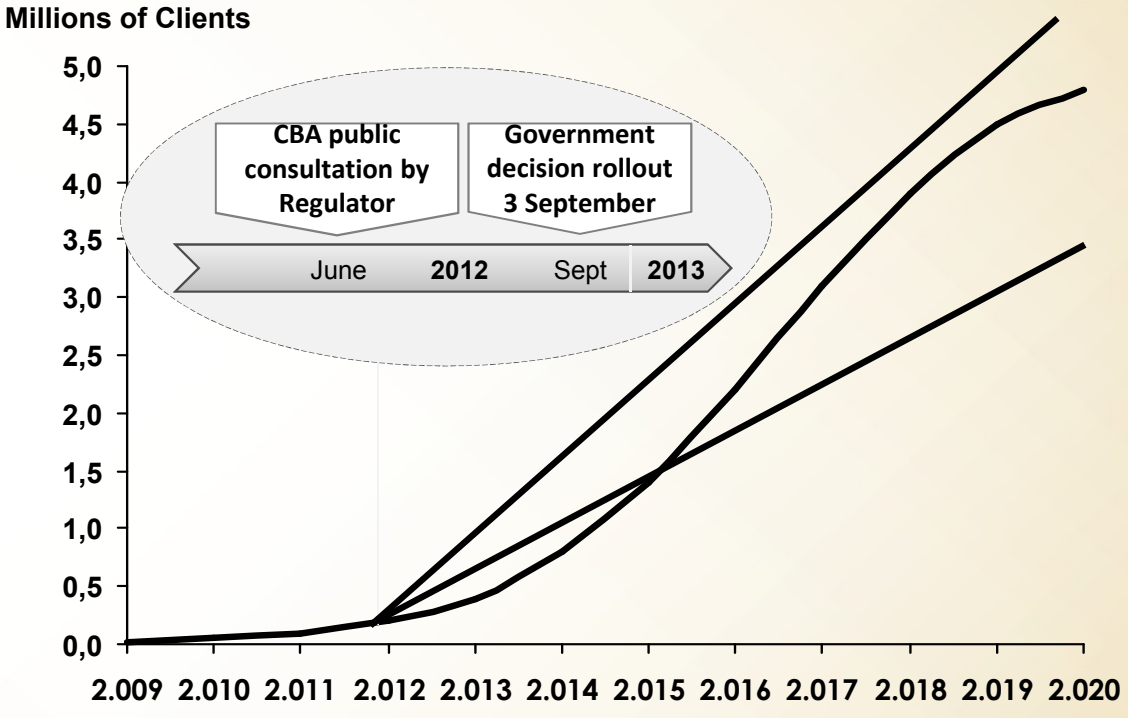
CBA presented by Portuguese Regulator:
NPV 8 rollout scenarios (Jun 2012)

Scenario 2 had the highest NPV:
- Aligned with InovGrid architecture
- Communications: 85% PLC e 15% GPRS
- Energy Efficiency 2% (Indirect Feedback)
- Roll-out starting 2014 until 2022 (100% EB)



Scenario 5 was the only NPV negative: 100% GPRS

Possible roll-out scenarios (illustrative):



- **Portuguese Regulator (ERSE) presented for public consultation in Jun 2012a cost-benefit evaluation with positive societal NPV.**
- **The conclusions were aligned with EPRI CBA built by EDP with JRC collaboration**

- **Following that, a decision from the Portuguese Government on smart meters roll-out is expected.**
- **InovGrid roll-out pace and extent will be determined and dependent of regulatory environment**

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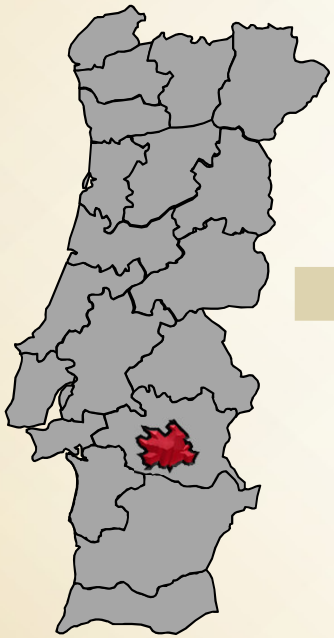
EDP Distribuição, is deploying the concept in other locations, to consolidate knowledge and test different technologies …

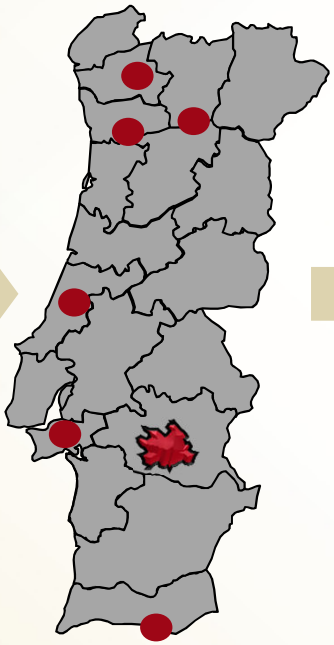
InovGrid deployment schedule

2010 — 2011 — 2012 — 2013 — 2014 — … — 2020

30k EBs
(Évora InovCity)



+150k EBs
(6 new locations)

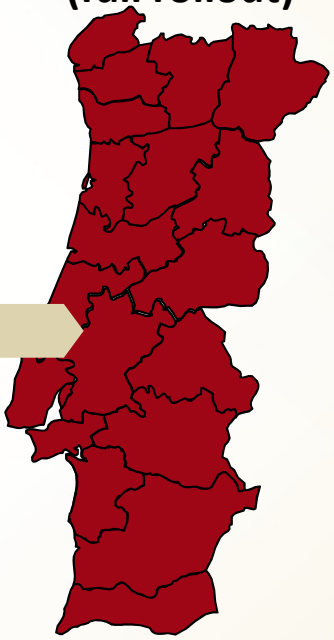


+200k EBs
(keep expansion)

Rollout date tbd

Government decision pending

6M EBs
(full rollout)



Key drivers:

- New technologies (PLC PRIME, RF Mesh);
- Different social and environmental characteristics;
- Different grid conditions;
- New smart grids applications;
- Increasing business process integration…

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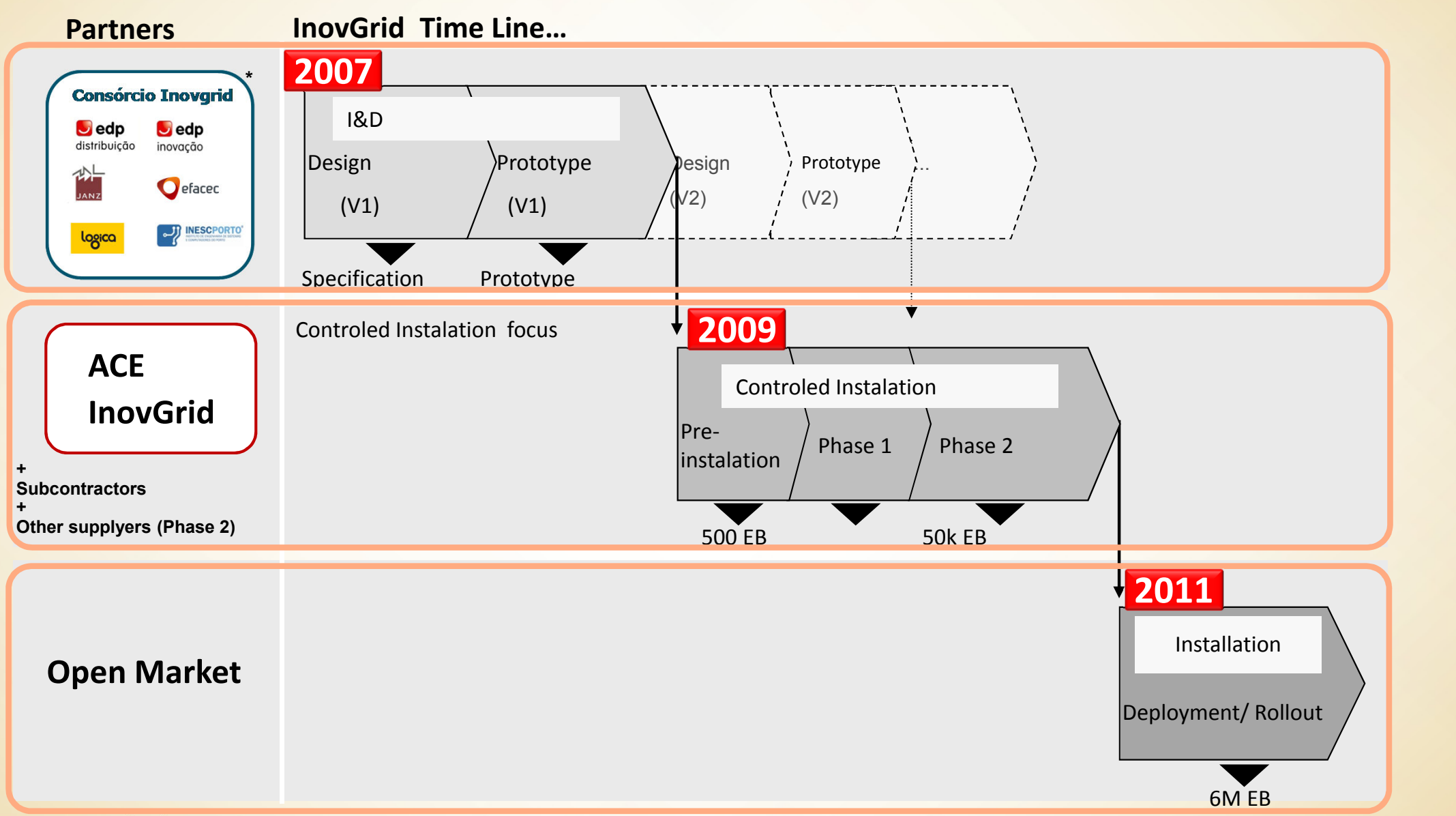
… supported on flexible Business Models for demonstration and partnerships development and deployment …



Conclusion

- EDP Distribuição focus on value creation in customer centric services and involving local stakeholders active participation …
- developing a future-proof solution in a project commercially tested enabling innovative smart services, as demonstrated in Évora – the 1st Iberian InovCity...
- strongly aligned with EDP group strategy aiming at Europe's goals ...
- involved in European Initiatives, Institutions and Projects focused on knowledge sharing and dissemination...
- providing an effective platform for Smart Cities initiatives.

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