



Contributions to Energy Efficiency

A meeting with the IHK Berlin Energy and Environment Commission
Câmara de Comércio e Indústria Luso-Alemã
May 21, 2012

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www.lisboaenova.org

LISBOA E-NOVA

- General presentation
- Technical projects

ENERGY

- World
- Portugal
- Lisbon

ENERGY EFFICIENCY USING METERING

- Smart meters
- Neighbor competition
- Remote manager

LISBOA E-NOVA



LISBOA E-NOVA

Contribute to Lisbon's sustainable development through the promotion and dissemination of good practice in energy and environment.

24 Affiliates

11 Workers

5.500 Mailing list subscribers

50 Communication actions/year

25 Current projects

AFFILIATES



MATRIX STRUCTURE



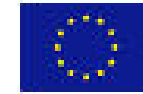
SAVE ENERGY

Developed within the 7 Framework Programme, between 2009 and 2011, involving 16 partners and 2,2 million euros.

Addressed the challenge of behavior transformation through the use of ICT (**serious games and real time information**) as an enabler of energy efficiency in five Public buildings in five European cities – Helsinki, Leiden, Lisbon, Luleå and Manchester.

Lisbon: the pilot was held in Lisbon's Municipality main office building, in block 1B.

The results evidence an energy consumption reduction via user behaviour change around 5%



APOLLON

Developed within the 7th Framework Programme, evolving 28 partners and 1,2 million euros.

- Create a European cluster of Living Labs focused on Energy Efficiency
- Promote dwellers behavioral change through the presentation of real time data regarding their electricity use and monthly informative billing;
- to implement energy efficiency measures in private households through behavior change and to test the effect of using smart metering technology and remote management tool in the decrease of energy consumption;
- The results evidence an energy consumption reduction via user behaviour change combined with the use of smart meters from 9 to 20%

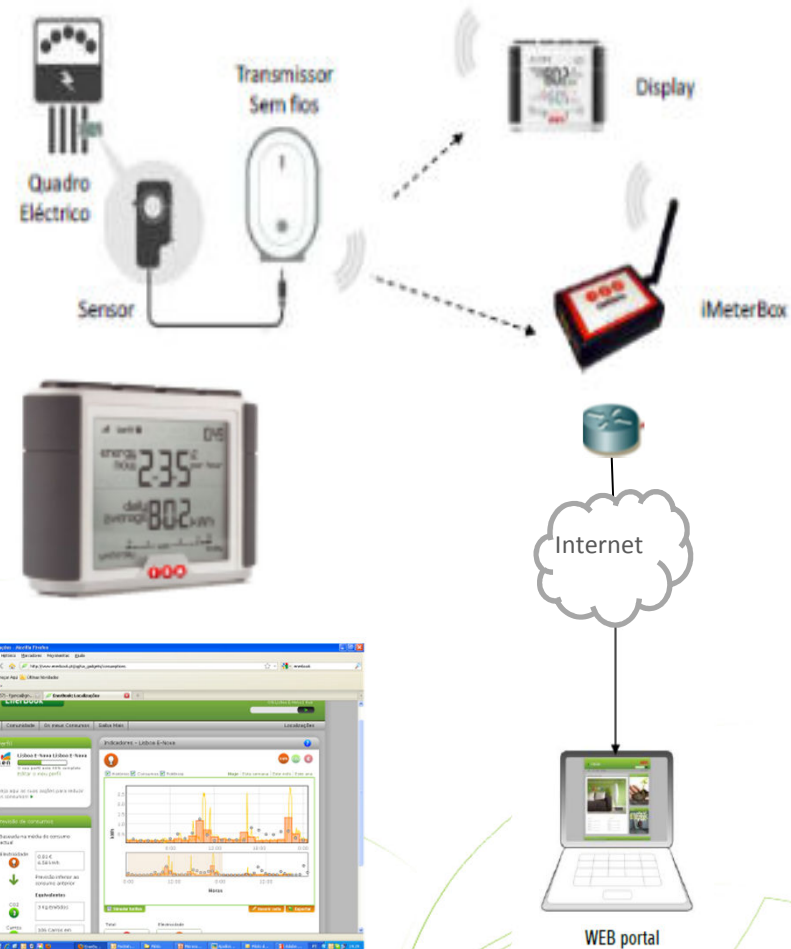


INTELLIGENT MONITOR FOR EFFICIENT DECISIONS

Promote dwellers behavioral change through the installation of telemetry systems that allow the visualization of the electricity consumption profile via local displays and internet platforms.

- 250 dwellings will be in this study and a special effort will be developed in support to consumers based on analysis of personal consumption profile.

Annual savings: 0,4 – 0,8 GWh/y
Total investment: 250.000 €
(supported by PPEC)



LED IN TRAFFIC LIGHTS

- Replacement of traffic lights technology in the centre of Lisbon
- Replacement of 1500 incandescent bulbs for LED (1st phase); Replacement of 2500 incandescent bulbs for LED (2nd phase);
- Considerable energy savings (about 90%), road safety and maintenance costs reductions.
- Lisbon has about 24,000 lights traditional lamps, and the savings potential 7 million kWh and 750.000 €.
- Investment payback between 3-5 years.



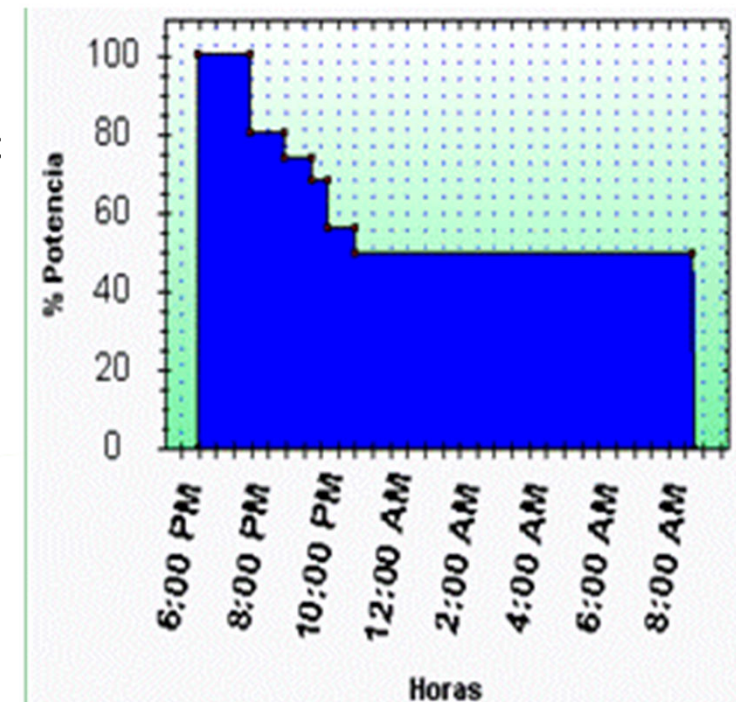
PUBLIC LIGHTING IN MONUMENTS

- Basilica da Estrela
- Consists of the technological upgrading of the lighting of the monuments, with improved lighting quality and reducing light pollution.
- Saving energy and economic: the estimated savings are higher than 50%.
- Applied to 10 monuments equivalent to the Basilica da Estrela, the annual savings will exceed half a million kWh and 40 000 €



ELECTRONIC BALLASTS WITH CONTROL FLUX REDUCTION

- Consists in the replacement of the ferromagnetic ballasts of 250 W (in high pressure sodium-vapor lamps) for electronic ballasts.
- Energy savings: up to 50%.
- Lisbon has about 15,000 lights that can be changed without any additional technical equipment, savings of 5 million kWh/y and 500.000 €/y.
- Investment payback between 3-5 years.

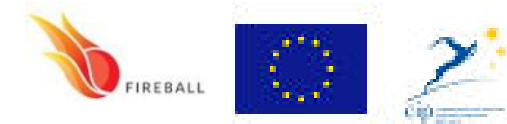


FIREBALL - Future Internet Research and Experimentation By Adopting Living Labs - Towards Smart Cities

Developed within the 7 Framework Programme, involving 17 partners and 1,5 million euros.

Goal – establish a cooperation mechanism through which a network of Smart Cities across Europe engages in long term collaboration for adopting User Driven Open Innovation to explore the opportunities of the Future Internet

Participating cities: Helsinki, Manchester, Lisbon, Amsterdam and Barcelona



URBAN SOL PLUS - Solar Thermal in Major Renovations

Developed within the Intelligent Energy Europe Programme, between 2011 and 2014, involves 10 partners and a 1M€ investment.

Intents to promote the adoption of solar thermal systems in multi-family buildings and classified areas.

Lisbon will share it's experience regarding the adoption of solar thermal in classified areas and focus on the promotion of collective solar thermal systems in multi-family buildings requalification's.



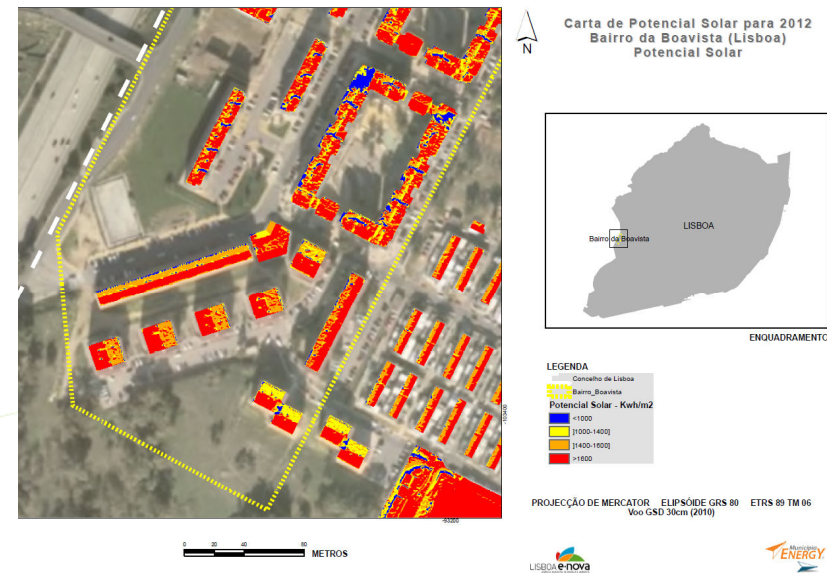
POLIS - Identification and Mobilization of Solar Potentials

Developed within the Intelligent Energy Europe Programme, with 12 partners involved, 6 cities and a 1M€ investment.

Intents to promote the adoption of solar urban planning tools.

Lisbon pilot actions:

- Identify Lisbon's built patrimony solar potential;
- Promote solar urban planning in Bairro da Boavista;
- Identify Evaluate Municipal patrimony solar potential;
- Organize training actions.

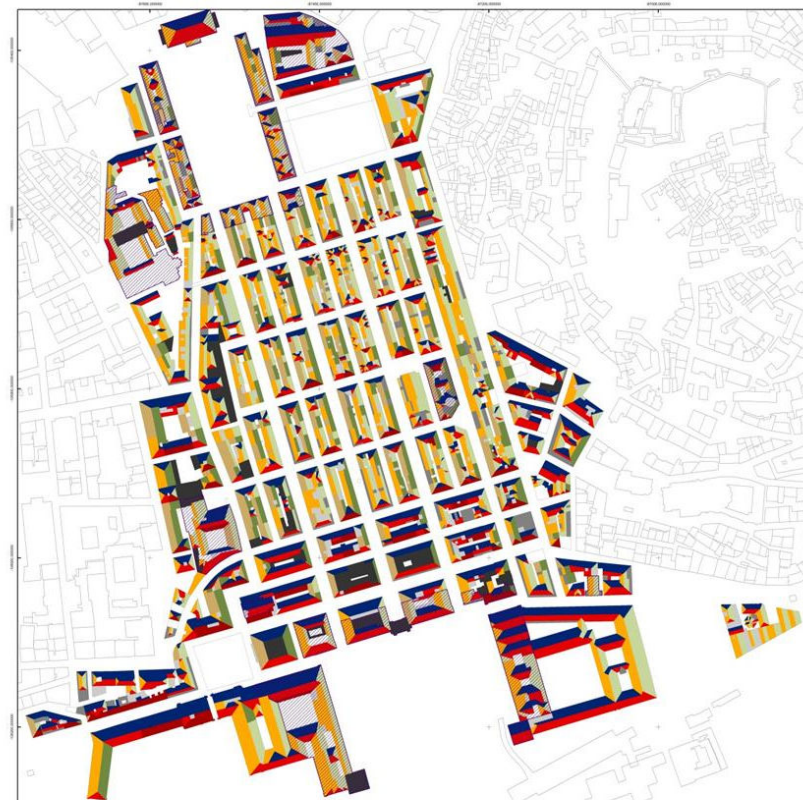


PROSTO - Best Practice Implementation of Solar Thermal

Developed within the Intelligent Energy Europe Programme, between 2008 and 2010, involved 11 partners and a 1.2M€ investment.

Fostered the sharing of experiences in the definition of solar thermal obligations.

In Lisbon the pilot project embraced the *Baixa Pombalina* area, where the potential for the integration of solar systems was evaluated and a local STO defined in accordance with the Local Safeguard and Protection Plan.

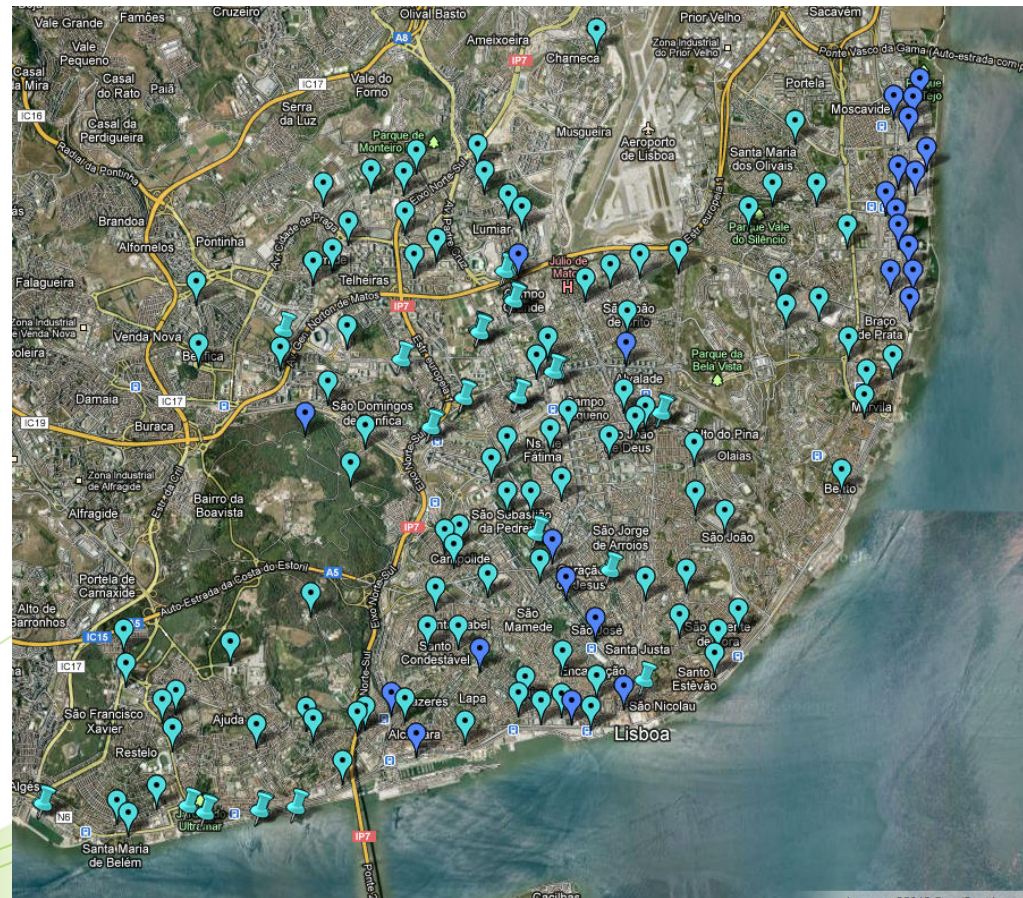


MOBI-E: ELECTRIC MOBILITY IN LISBON

Project coordination of the location of 514 slow charging points for electric cars in the city of Lisbon.

During 2012 will be installed:

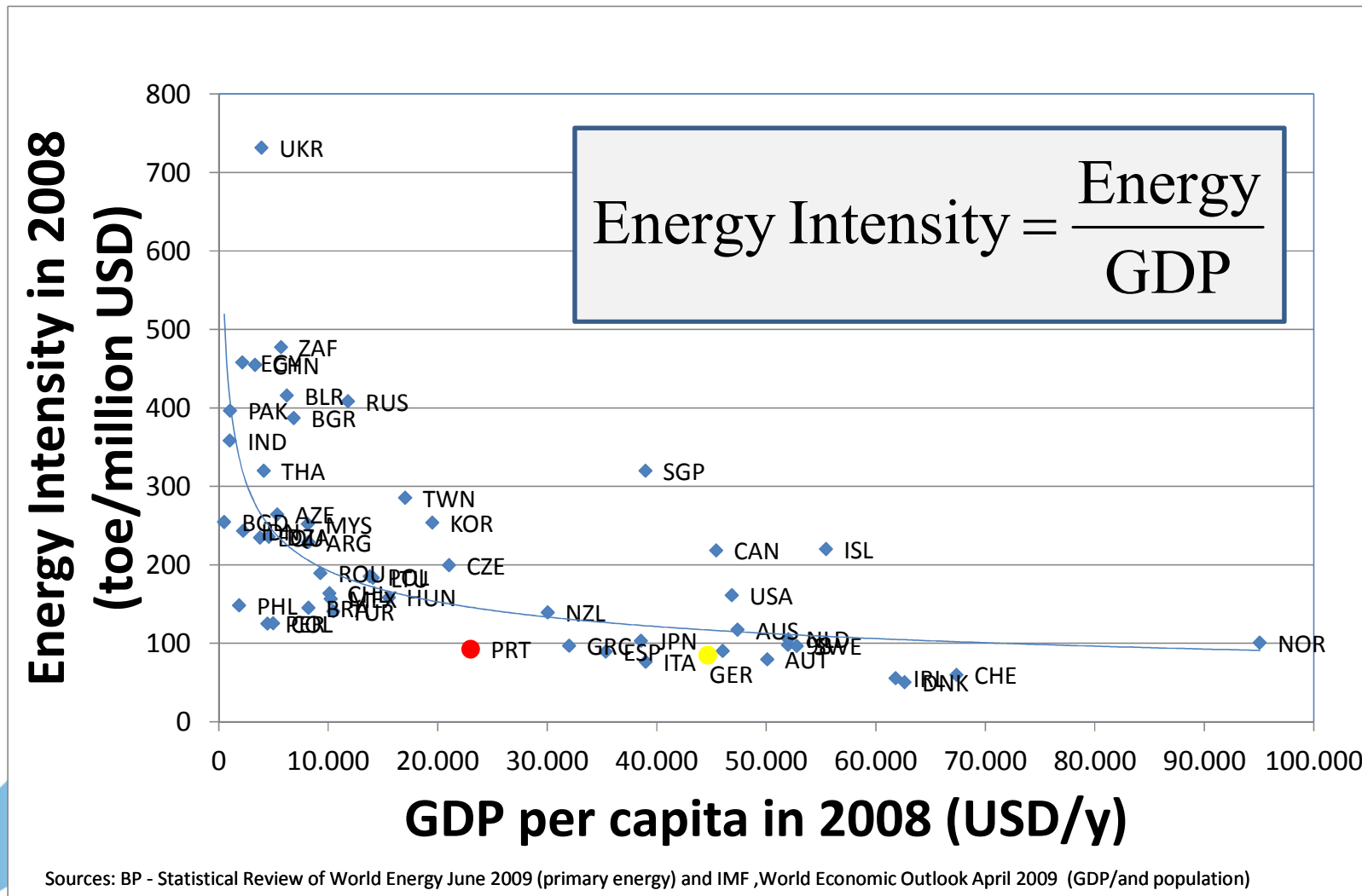
- 30 slow charging points for electric motorcycles/ bicycles
- 9 fast charging points



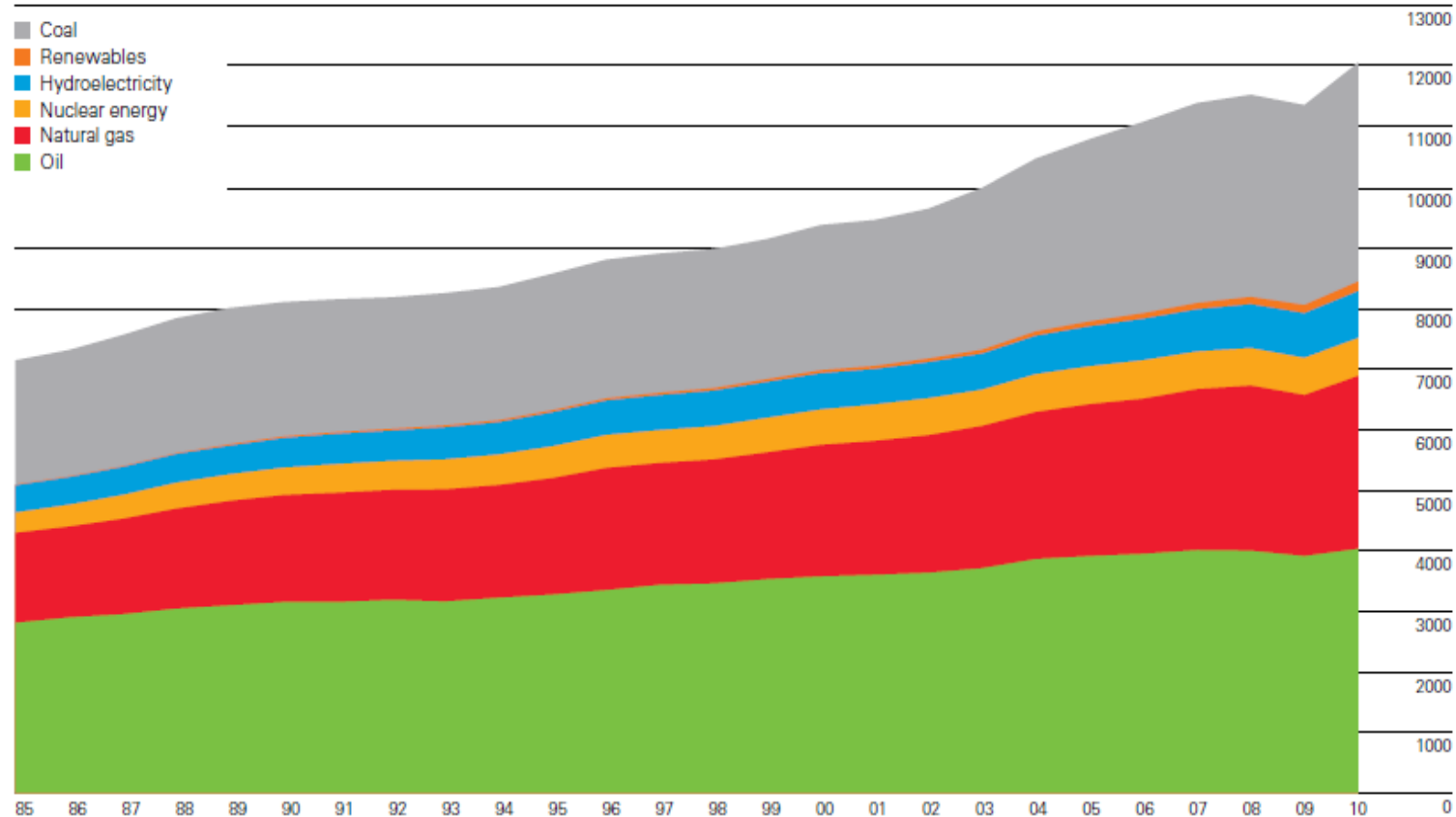
ENERGY - WORLD



ECONOMIC STRUCTURE



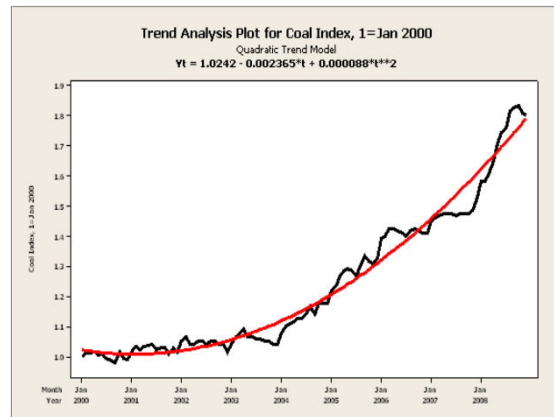
WORLD ENERGY CONSUMPTION



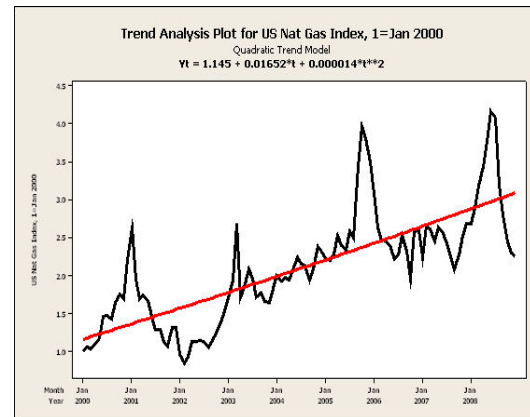
Source: BP- Statistical Review of World Energy 2011

ENERGY PRICES

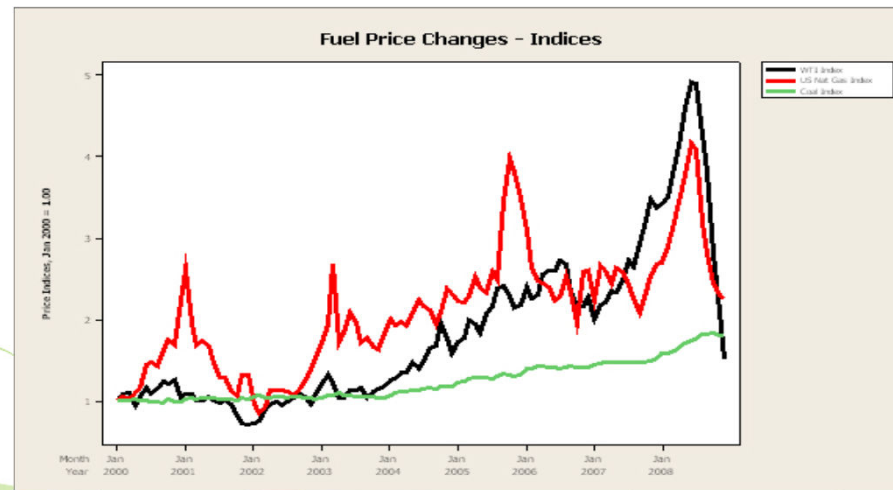
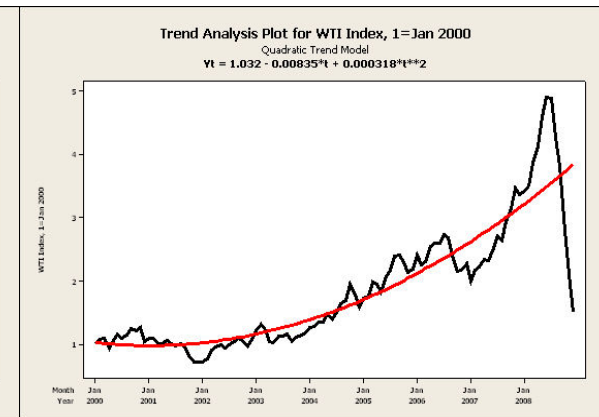
COAL



NATURAL GAS



OIL

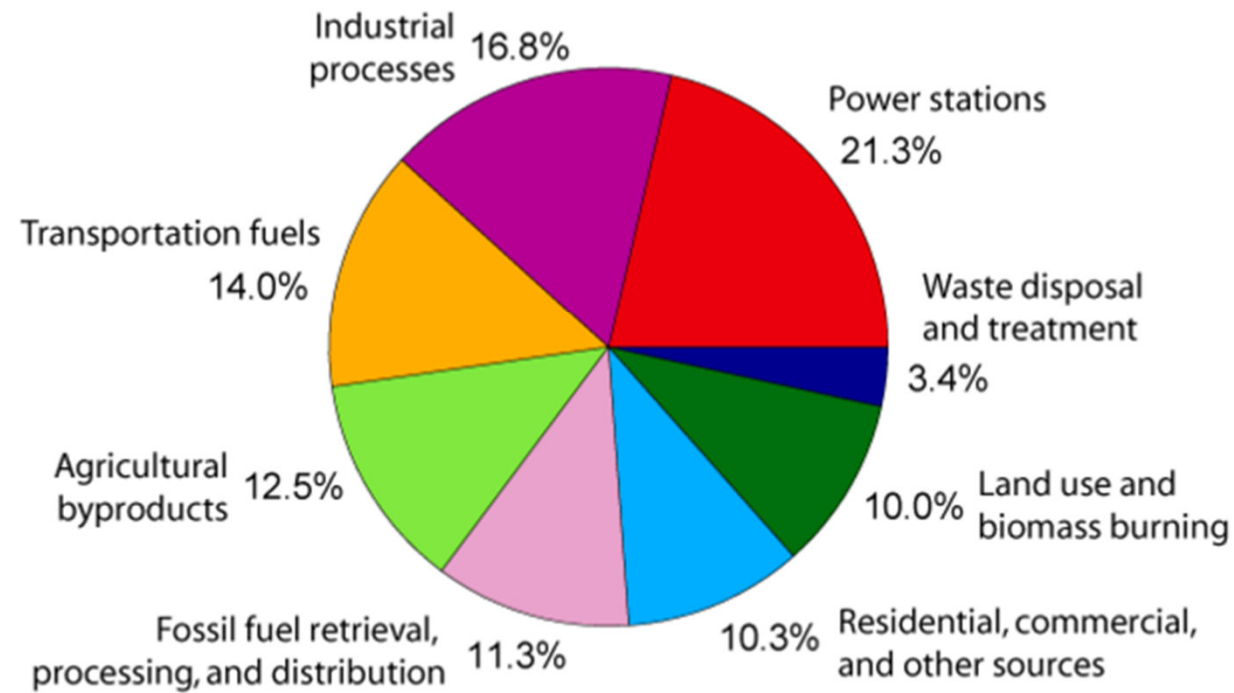


Source: RN-EconomicAnalysis

CO₂

$$\text{CO}_2 \text{ emissions} = \text{Popul.} \times \frac{\text{Production}}{\text{Population}} \times \frac{\text{Energy}}{\text{Production}} \times \frac{\text{CO}_2}{\text{Energy}}$$

Annual Greenhouse Gas Emissions by Sector



Source: Wikipedia

ENERGY - PORTUGAL



ELECTRICITY

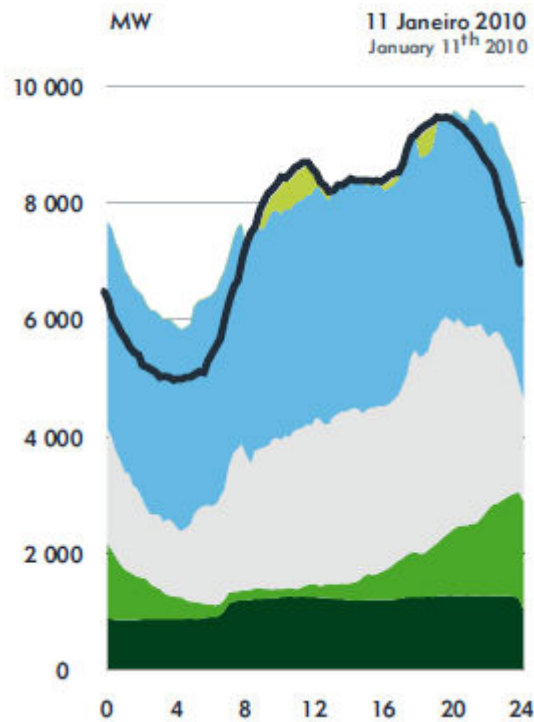
Electricity production 2007 - 2010

TYPE		ENERGY (GWh)				POWER (MW)			
		2007		2010		2007		2010	
Hydric	Reservoirs	3.444		6.473		2.403		2.397	
	Run-of-river	6.079		8.396		2.179		2.182	
	Pumping	-540		-512					
	SUBTOTAL	8.983	21%	14.357	29%	4.582	33%	4.579	26%
Special production	Wind	4.002		9.025		1.894		3.702	
	Cogeneration	5.435		7.312		1.362		1.696	
	Minihydric	698		1.380		373		410	
	Photovoltaics	20		208		11		122	
	SUBTOTAL	10.155	24%	17.925	36%	3.640	26%	5.930	33%
Thermal	Coal	11.662		6.554		1.776		1.776	
	Natural gas CC	10.494		10.700		2.166		3.829	
	Other	1.268		46		1.877		1.821	
	SUBTOTAL	23.424	55%	17.300	35%	5.819	41%	7.426	41%
TOTAL PRODUCTION		42.562		49.582		14.041		17.935	
Import balance		7.488		2.623					
TOTAL DEMAND		50.050		52.205					
Demand increase: 1,4% /y					Power increase: 8,5% /y				

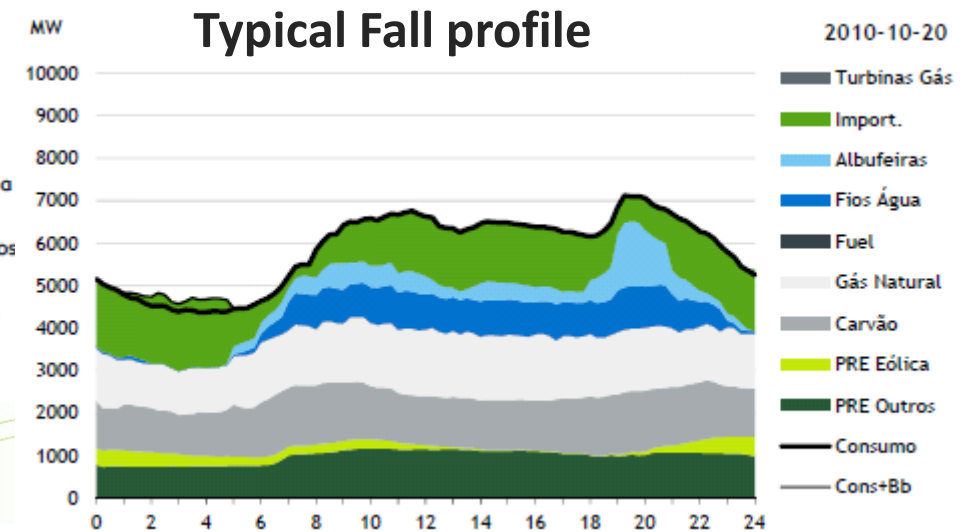
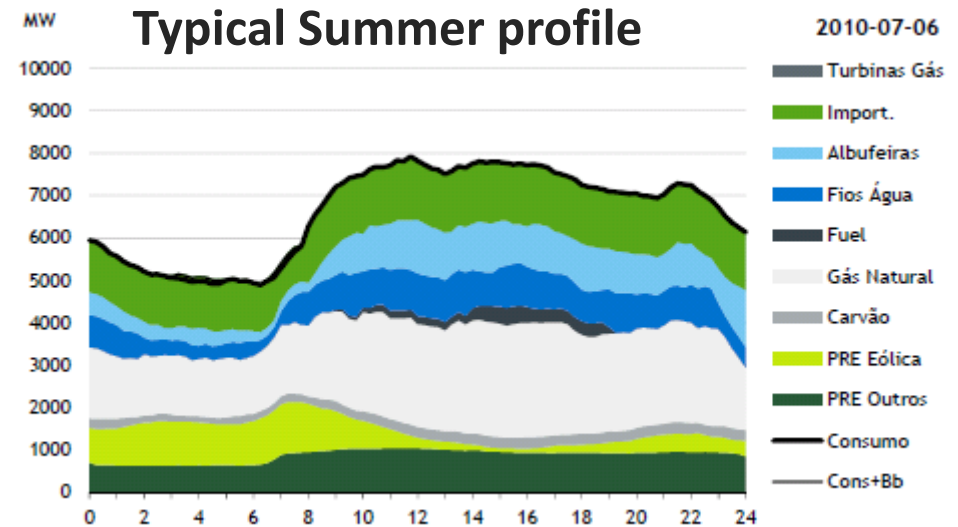
Source: REN (www.ren.pt)

ELECTRICITY - LOADS

Load diagram on the annual peak demand

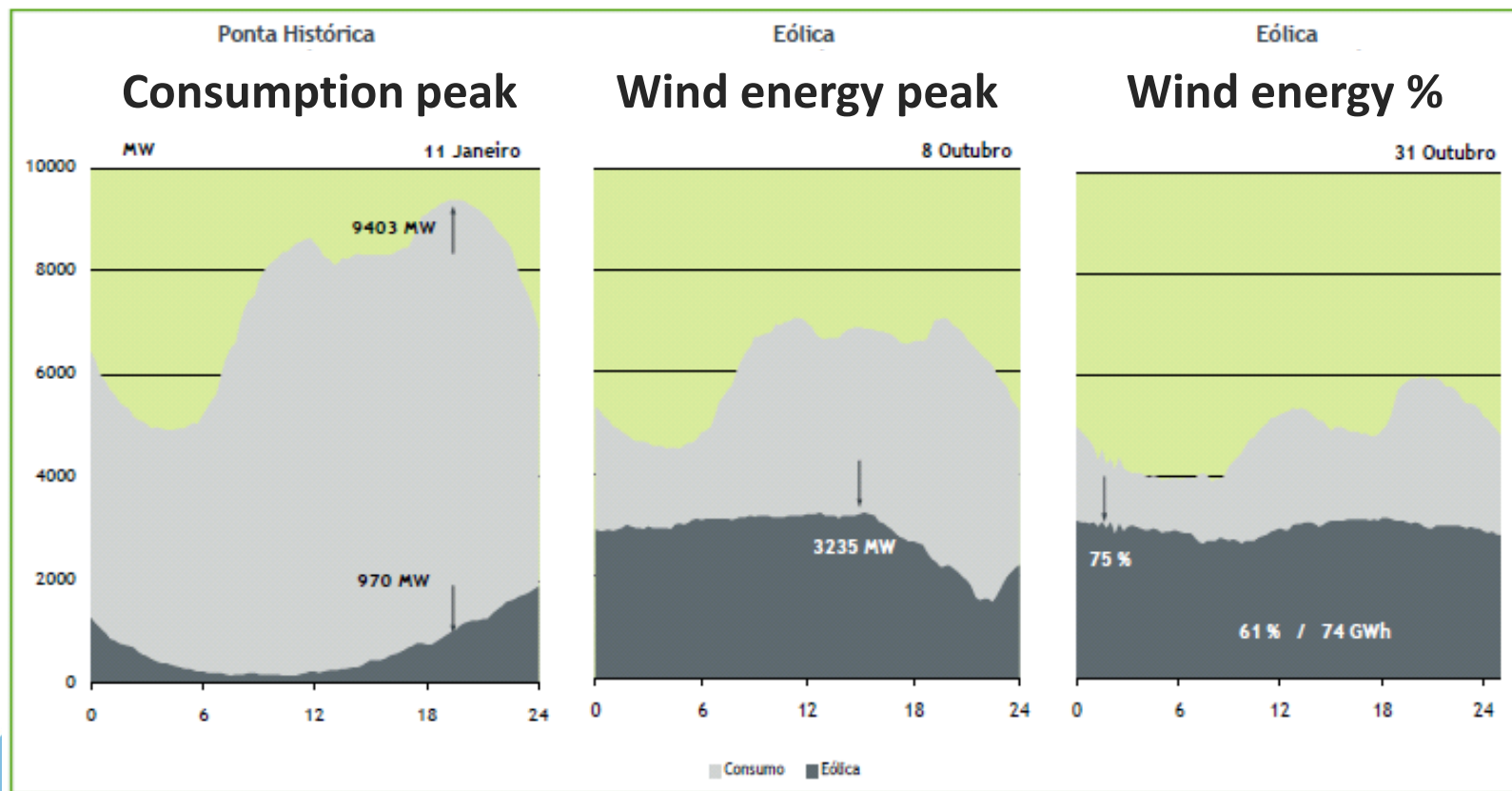


Source: REN (www.ren.pt)



ELECTRICITY

Wind energy production in 2010

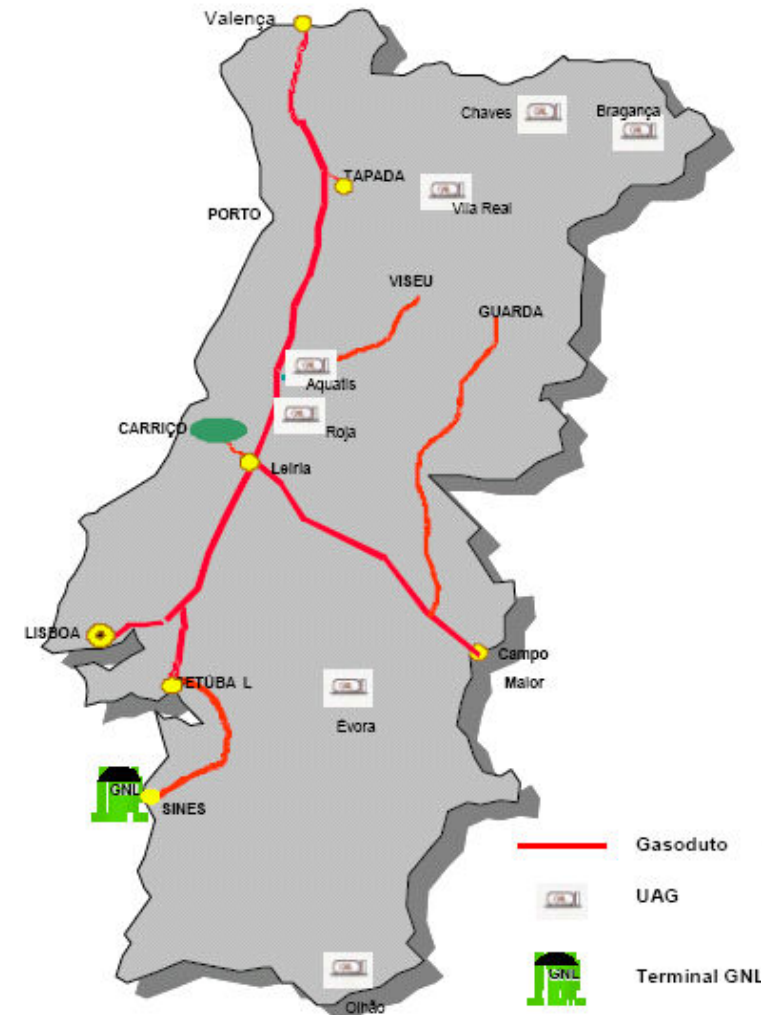


Source: REN (www.ren.pt)

NATURAL GAS

- 44%: By pipeline, entering at Campo Maior (from Argelia)
- 56%: By LNG, at Sines (from Nigeria)

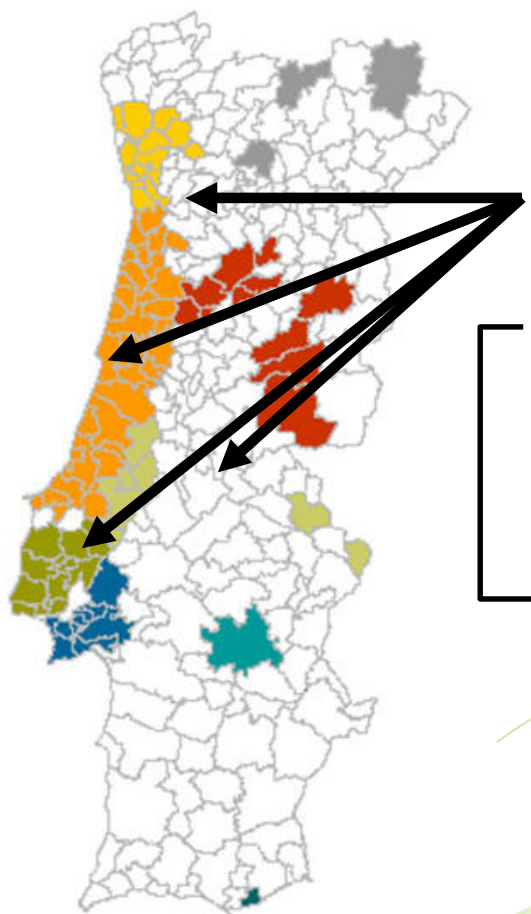
(2010)



Source: REN (www.ren.pt)

Fonte: Transgás

NATURAL GAS



NATIONAL CONSUMPTION (FORECAST 2011/12) (GWh/y)		
Combined cycles	27.462	40%
Direct clients	15.445	23%
Distributors	25.446	37%
TOTAL	68.353	

Lusitaniagás	8.610	34%
Portgás	6.782	27%
Lisboagás	6.308	25%
Setgás	1.952	8%
Others	1.794	7%

Source: ERSE (www.erse.pt)

ENERGY - LISBON

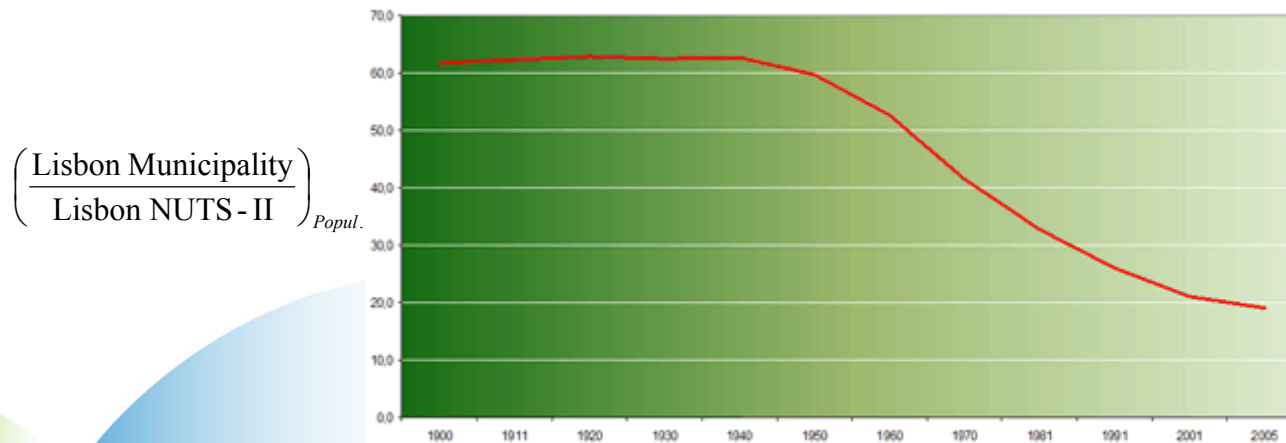


POPULATION

Reduction of population in favor of the surrounding municipalities – NUTS II

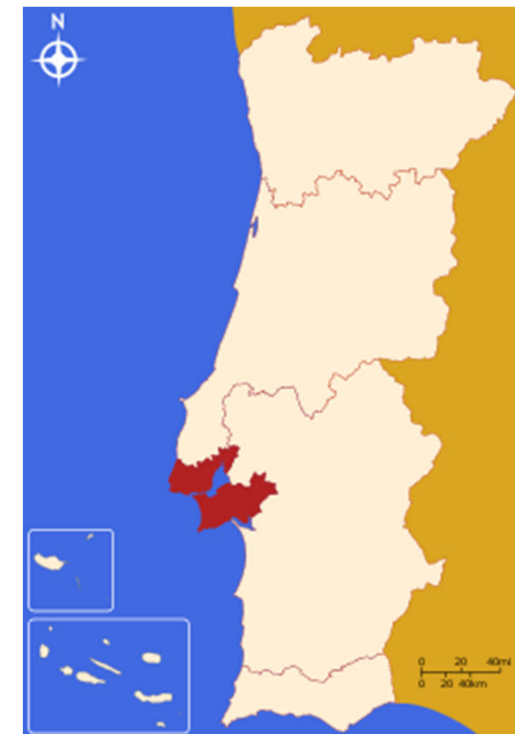
	1981	2010
City	808.786	469.509
NUTS-II	2.494.179	2.839.908

Source: www.pordata.pt



Source: Presidência da República (www.presidencia.pt)

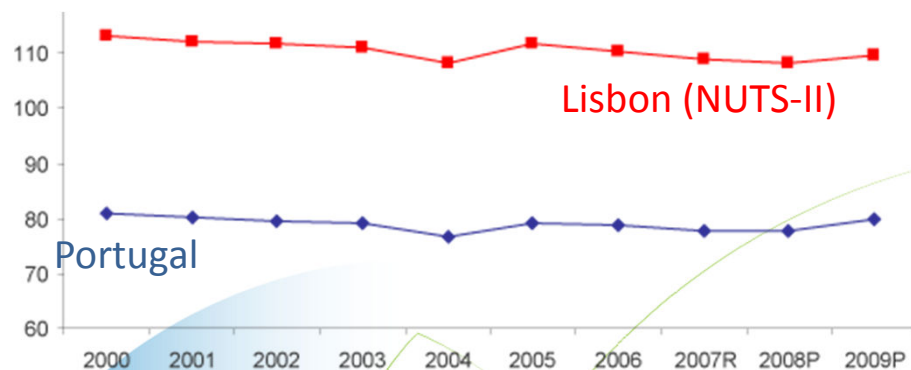
NUTS II - LISBON



ECONOMY

Lisbon
concentrates the
economy activity

GDP₂₀₀₉/cap in PPP (EU27 = 100)



Source: AICEP (www.portugalglobal.pt)

ANNUAL SALES

(Non-financial activities)

	2009 (M€)	% of National
City	84.415	25%
NUTS-II	160.301	48%
National	335.887	

Source: www.pordata.pt

GDP

	2009 (M€/y)	% of National
NUTS-II	61.486	37%
National	168.046	

Source: AICEP (www.portugalglobal.pt)

ENERGY CONSUMPTION

Electricity

National final consumption of 49 TWh/y
Lisbon City represents ~ 7%

Gasoline and gasoil

National final consumption of 6 M ton/y (71 TWh/y)
Lisbon City represents ~ 5%

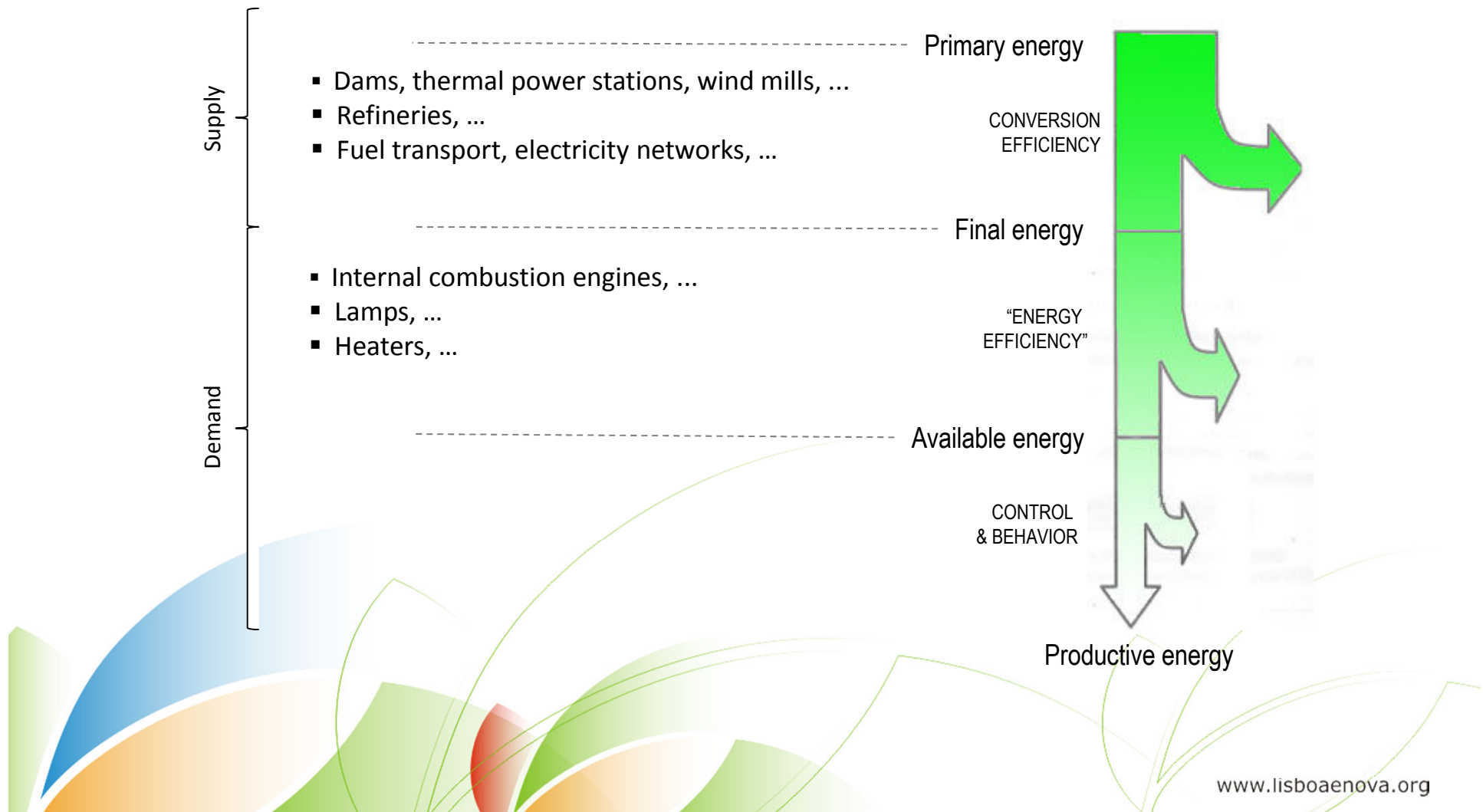
Natural gas

National final consumption of 3,4 bcm/y (41 TWh/y)
Lisbon City represents ~ 8%

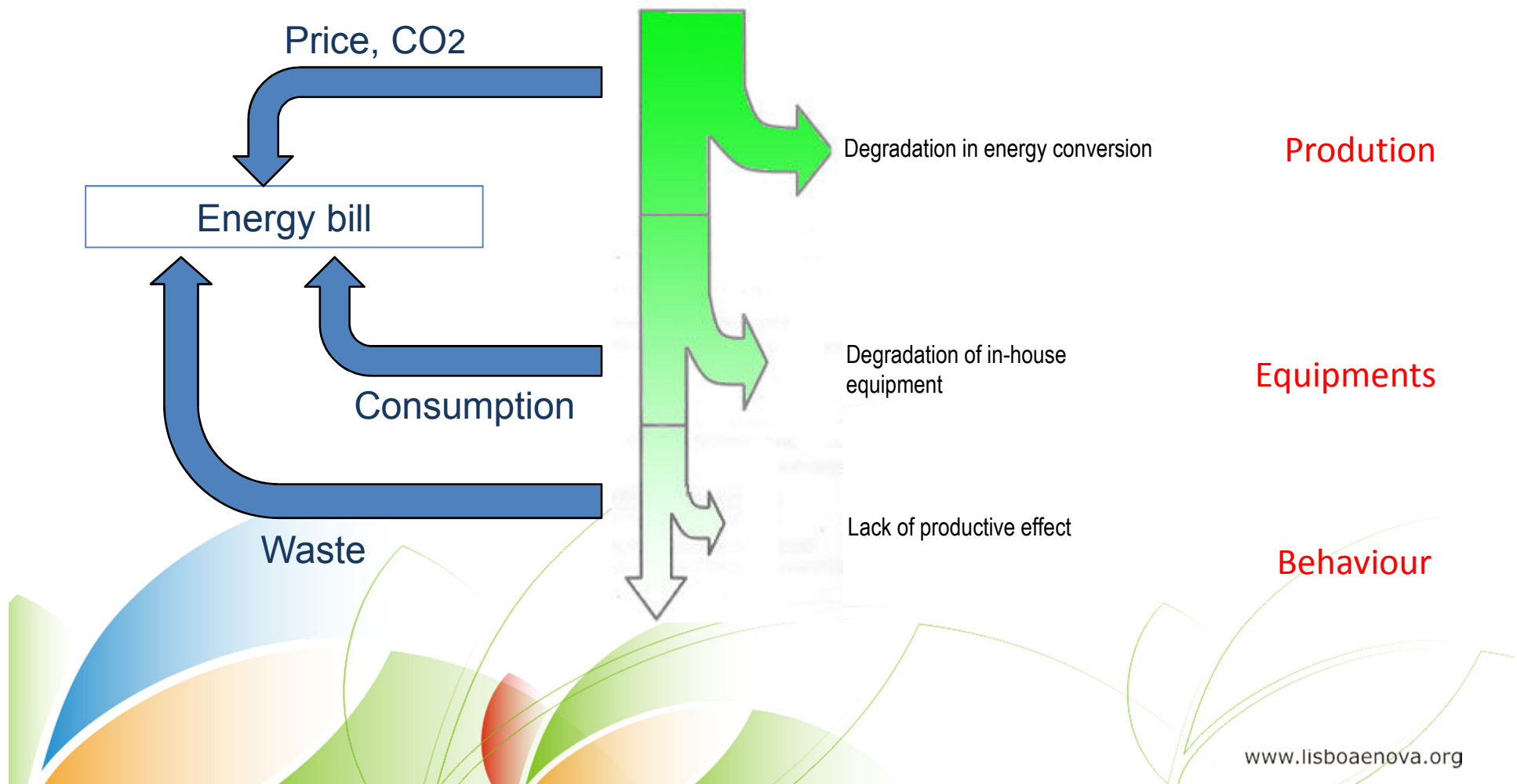
ENERGY - TRANSFORMATION



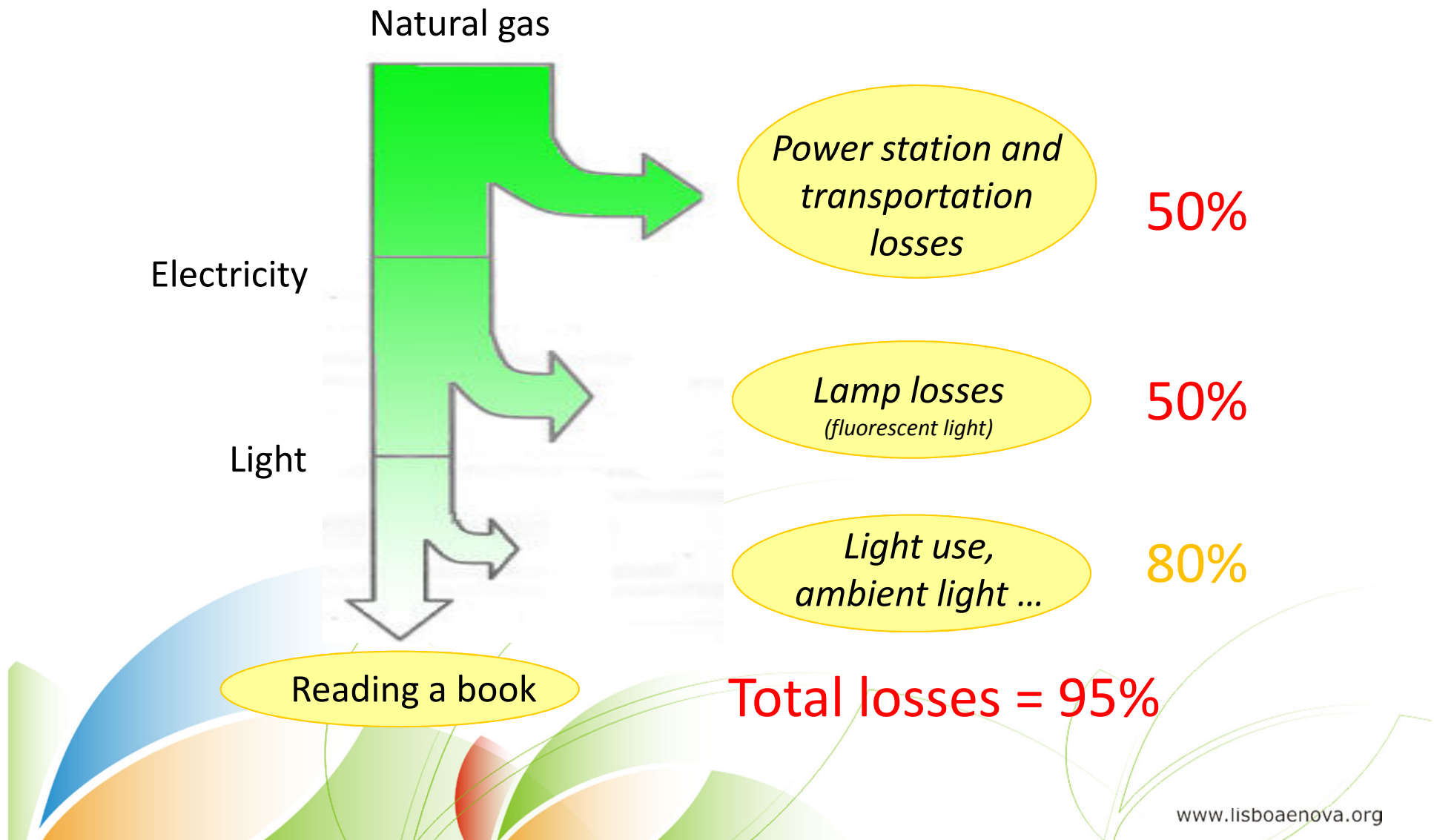
SANKEY DIAGRAM



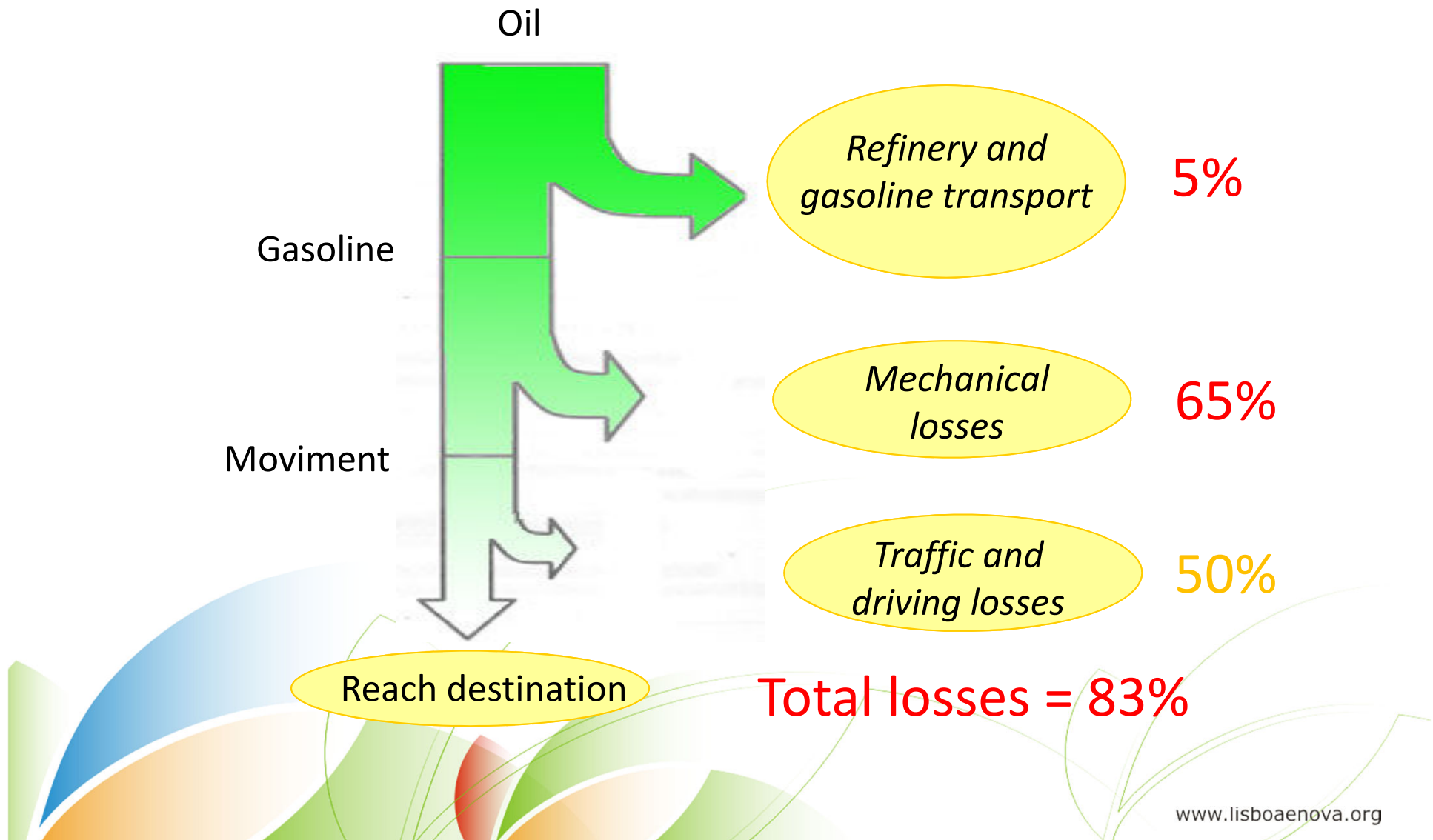
SANKEY DIAGRAM



SANKEY DIAGRAM – LIGHTING EXAMPLE



SANKEY DIAGRAM – DRIVING EXAMPLE



SANKEY DIAGRAM – ELECTRIC .VS. CONVENTIONAL CARS EXAMPLE



$$\eta_{v.electric} = \eta_{central} \eta_{transp+carreg} \eta_{elec.engine}$$

$$\eta_{electric} = 38\% \times 90\% \times 90\% = 31\%$$

100% if
renewable



$$\eta_{combustion} = \eta_{refinary} \eta_{transp} \eta_{comb.engine}$$

$$\eta_{combustion} = 95\% \times 98\% \times 33\% = 31\%$$

... but in costs:

17 kWh_{elec} /100 km = 2 €

5 l_{combust} /100 km = 9 €

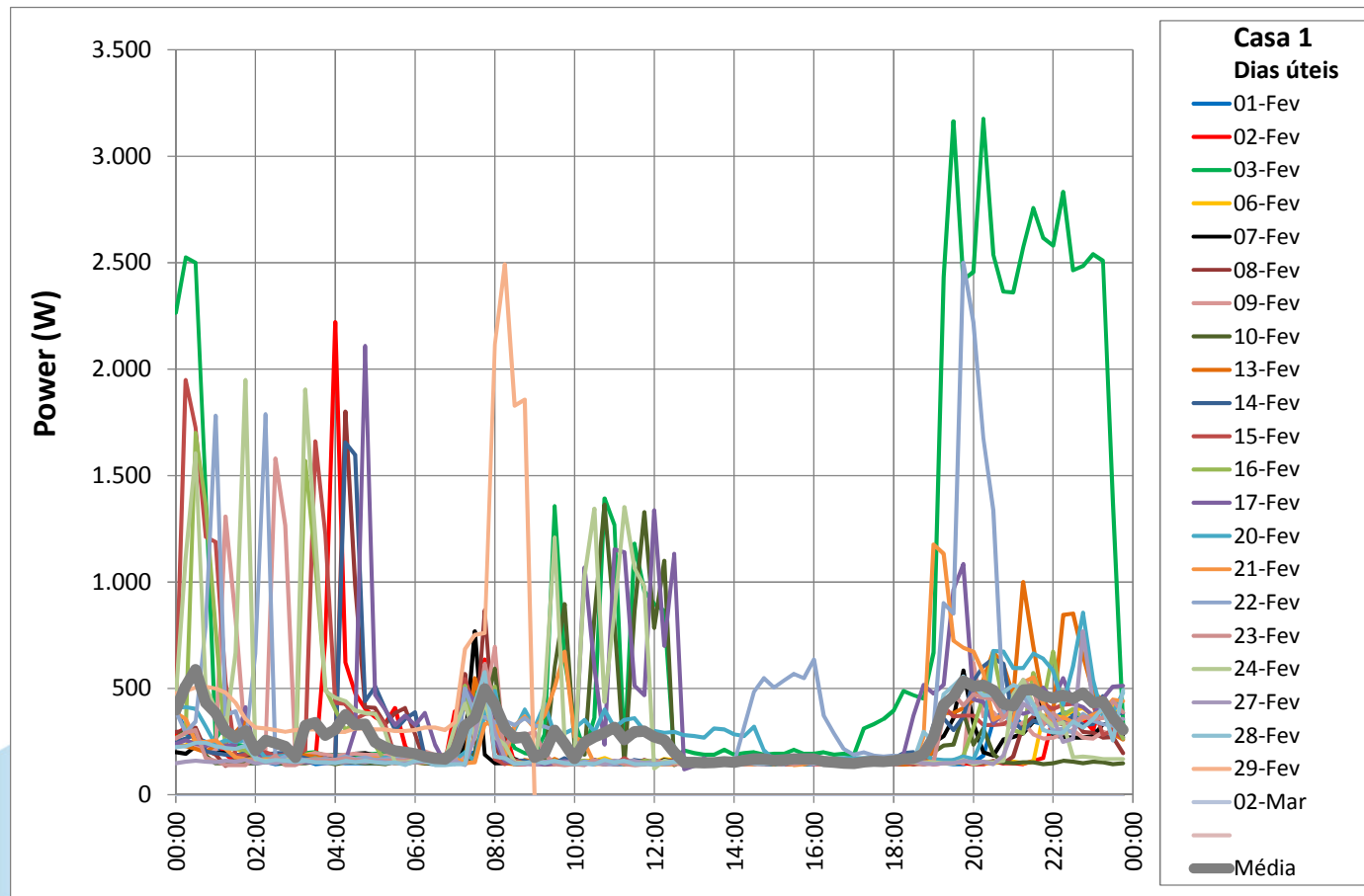
ENERGY EFFICIENCY USING METERING

LISBOA E-NOVA DEVELOPPED DIFERENT ENERGY EFFICIENCY SOLUTIONS BASED IN METERING

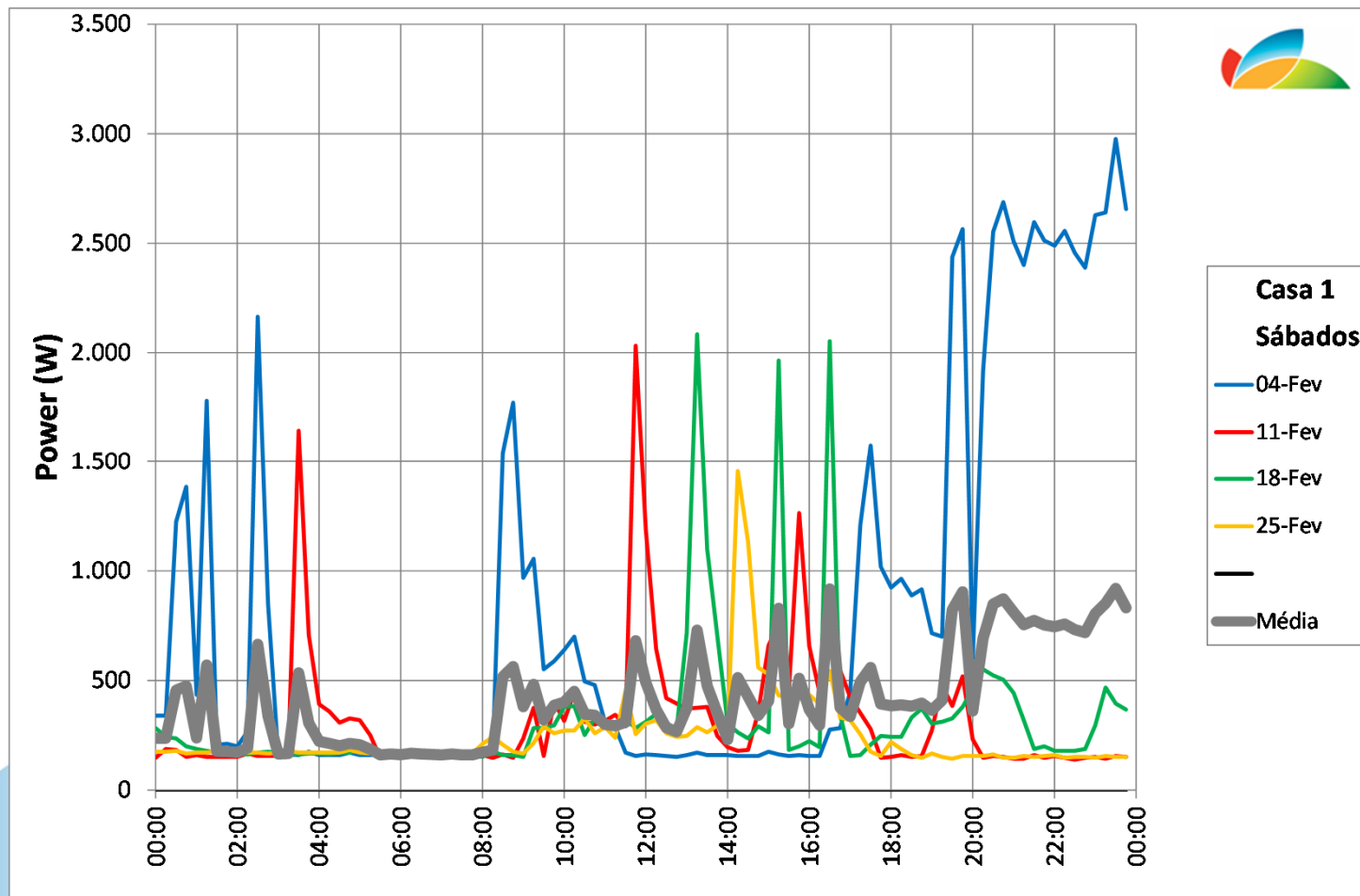
- For residential or companies consumers
- Diferent investment in metering

	No investment	With investment
Residential	COMPETITION	Smartmeter
Companies	REMOTE MANAGER	Online electrical Disaggregation

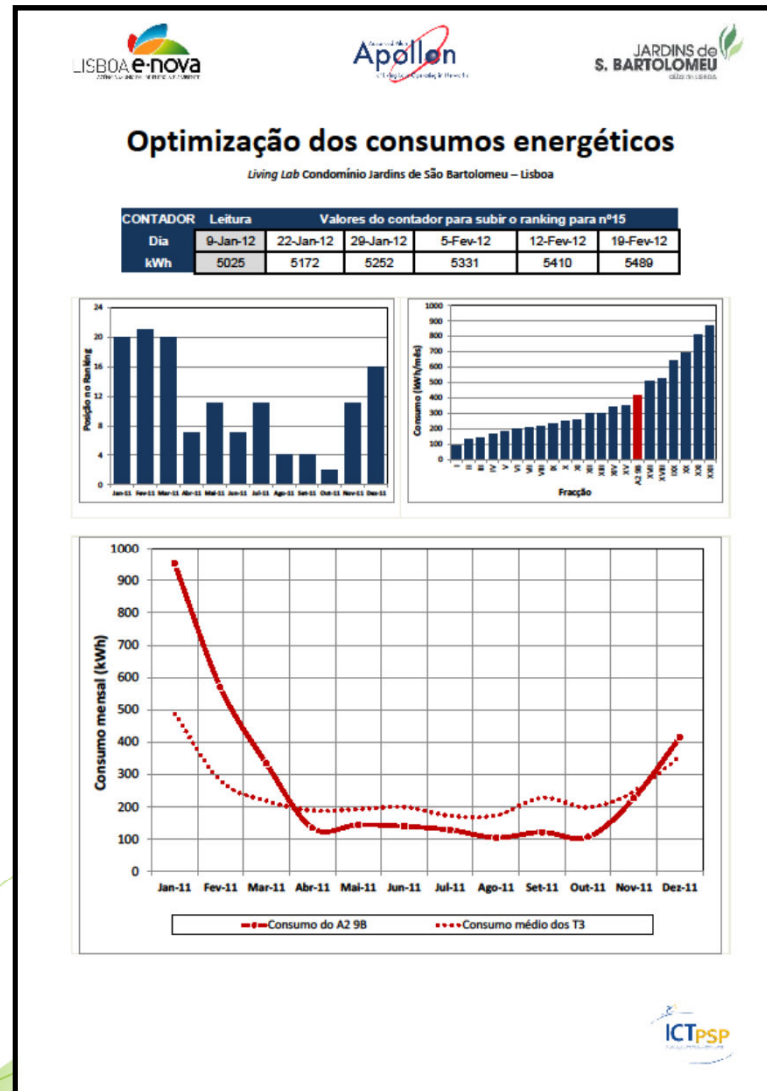
SMARTMETERS – RESIDENTIAL – WORKING DAYS EXAMPLE



SMARTMETERS – RESIDENTIAL – SATURDAYS EXAMPLE



COMPETITION

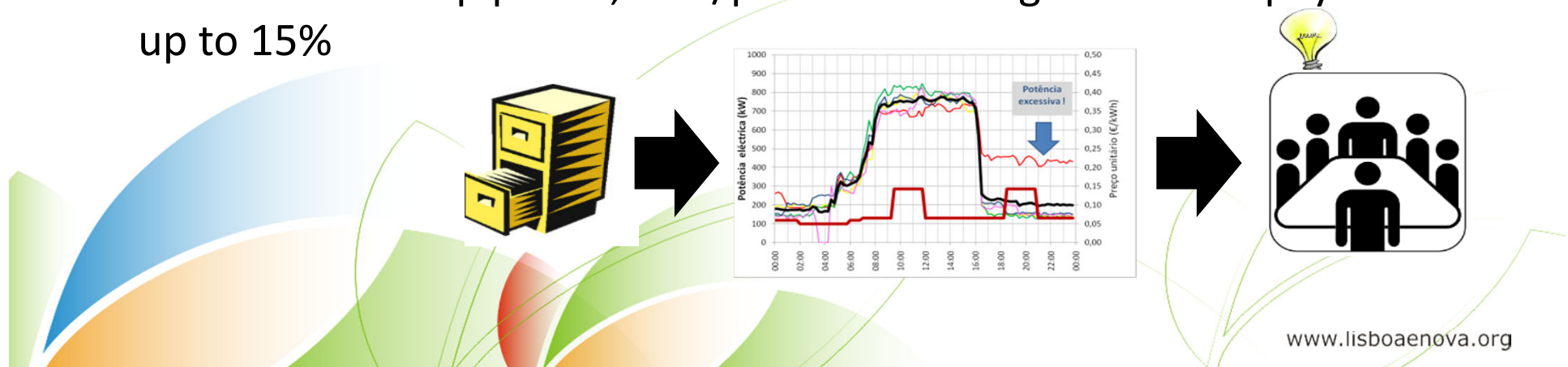


REMOTE MANAGEMENT – OBJECTIVES

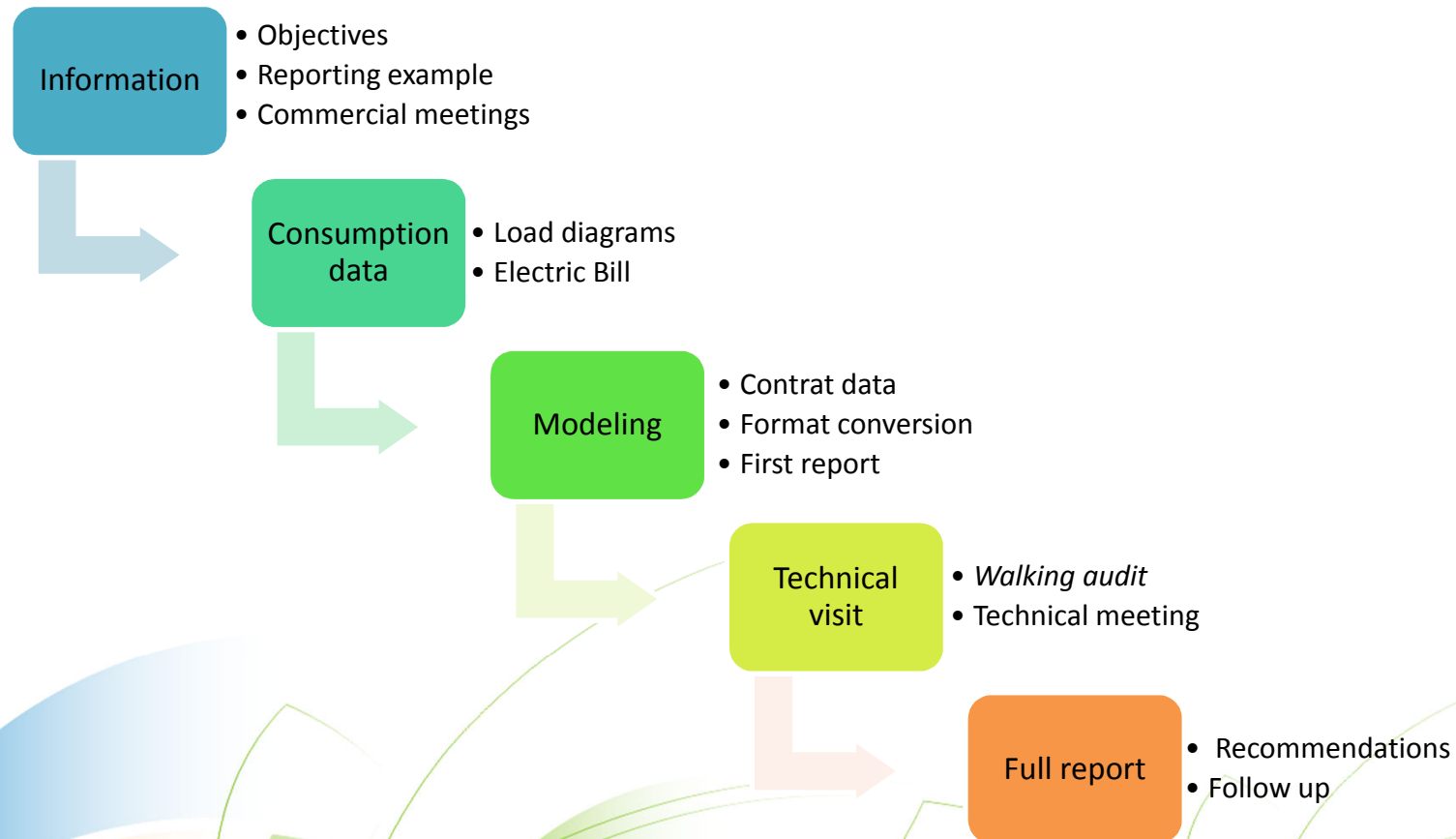
In Municipal buildings and buildings from Lisboa E-Nova Associates, Lisboa E-Nova promotes the remote manager project.

It's objective is to present energy efficient solutions based on:

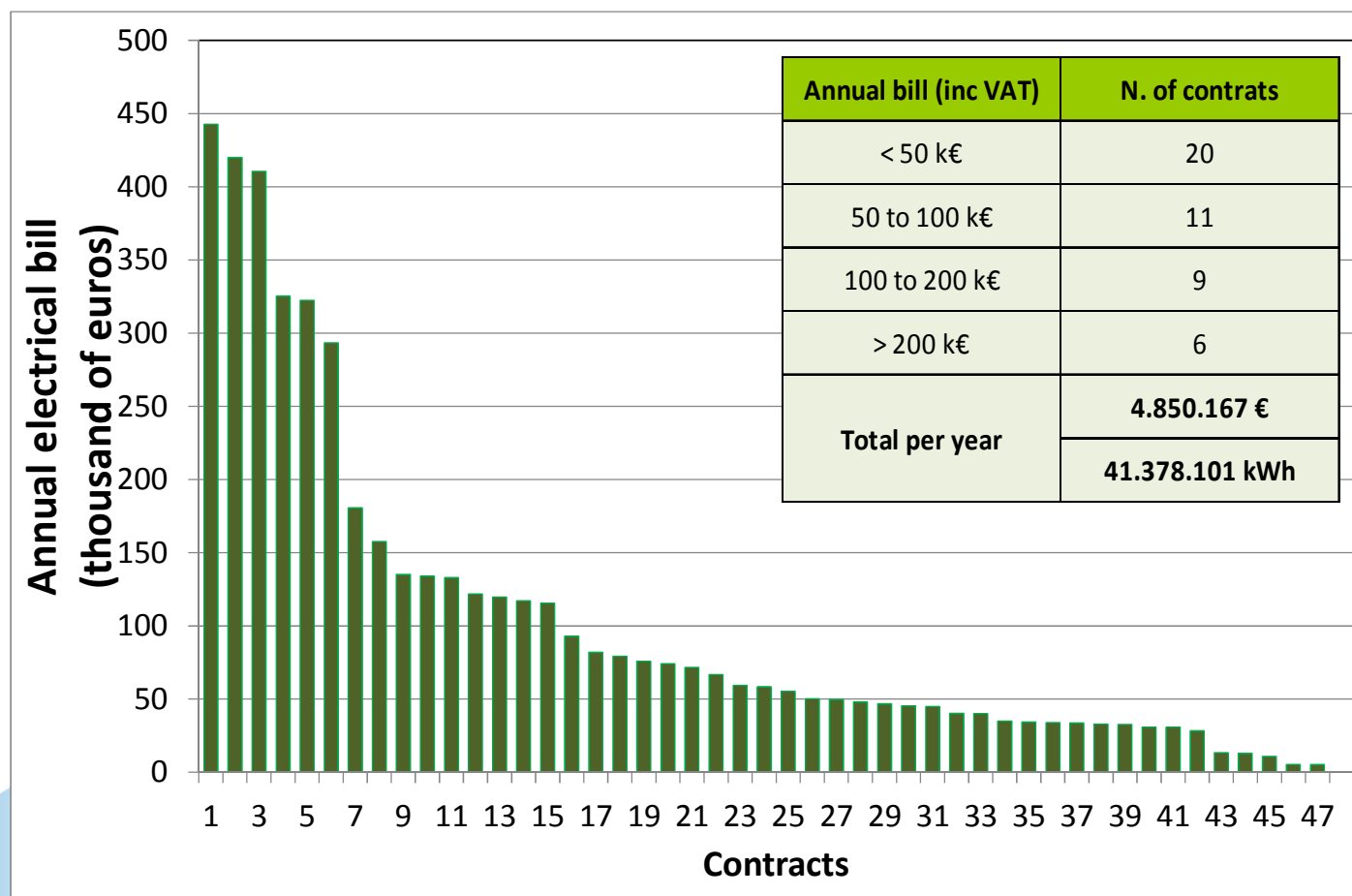
- Uses the telemetry system installed by the distributor
- Team work: (Lisboa E-Nova) + (Maintenance and Costs control departments)
- 1 in each 37 kWh consumed in medium (or high) voltage in Lisbon is already analyzed by Lisboa E-Nova.
- For the current pipeline, real/potential savings with low pay-back is up to 15%



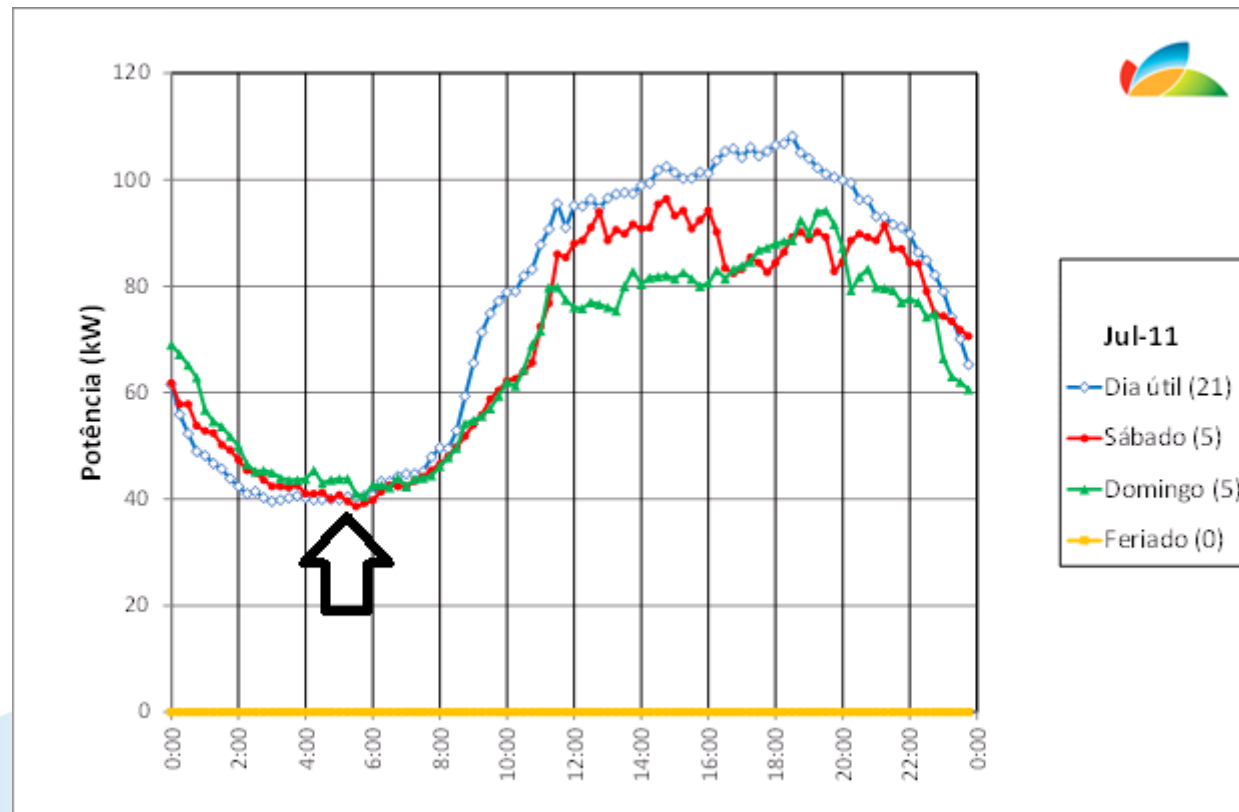
REMOTE MANAGEMENT – METHODOLOGY



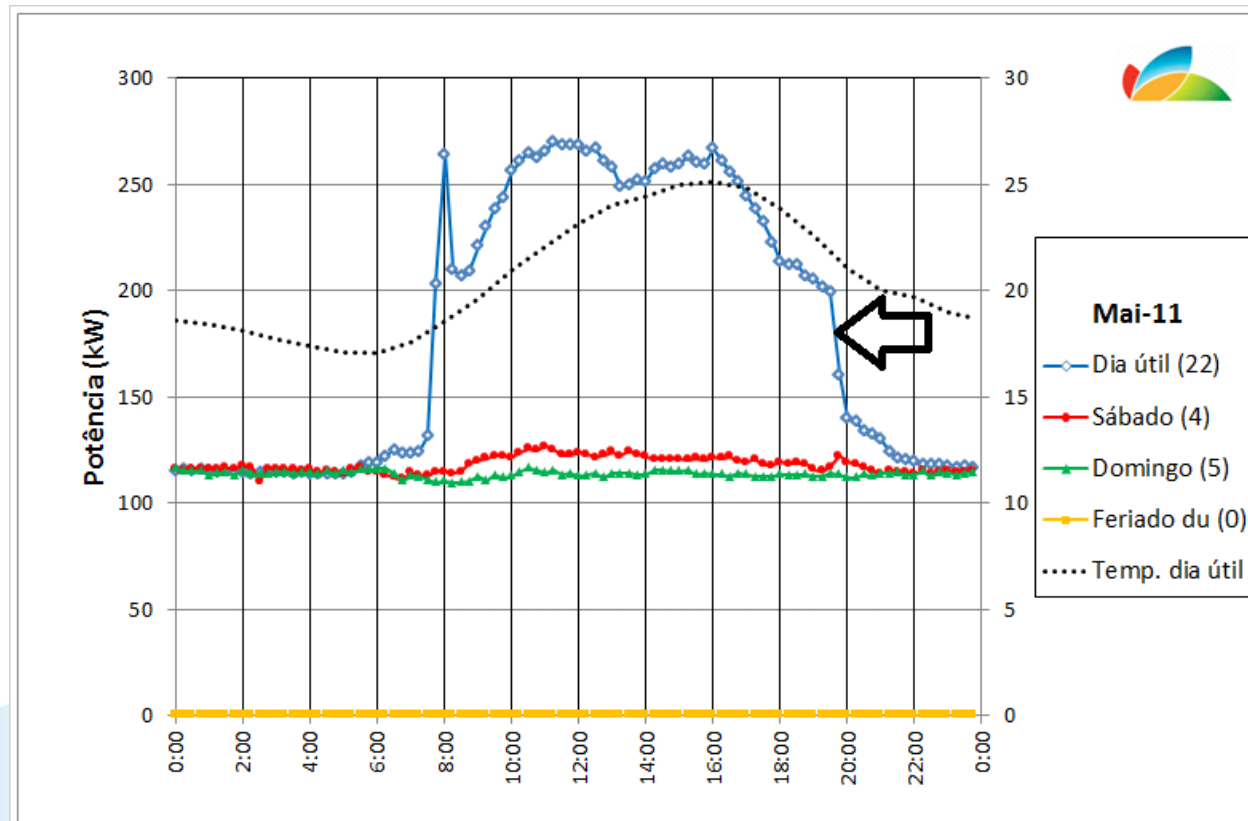
REMOTE MANAGEMENT – PARTICIPANTS



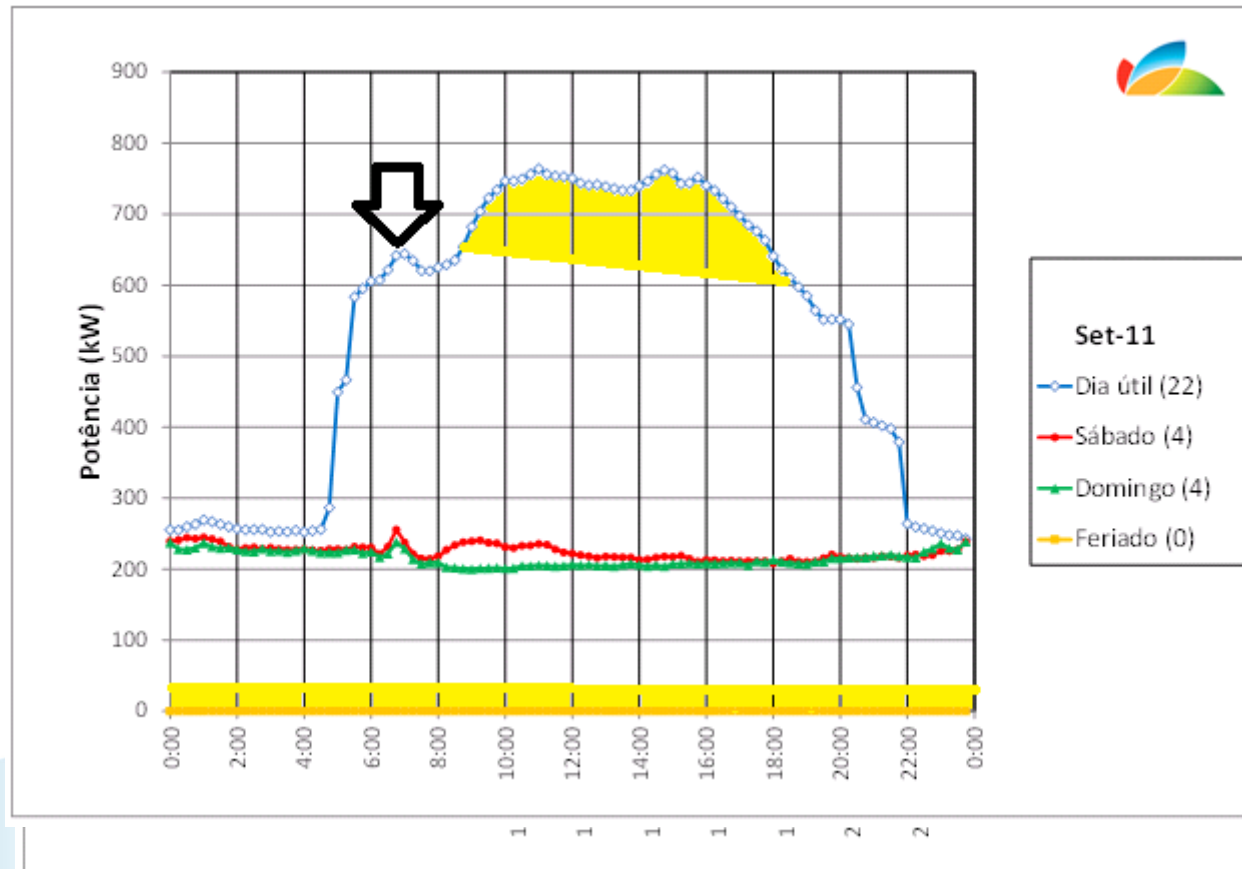
REMOTE MANAGEMENT – ANALYSIS



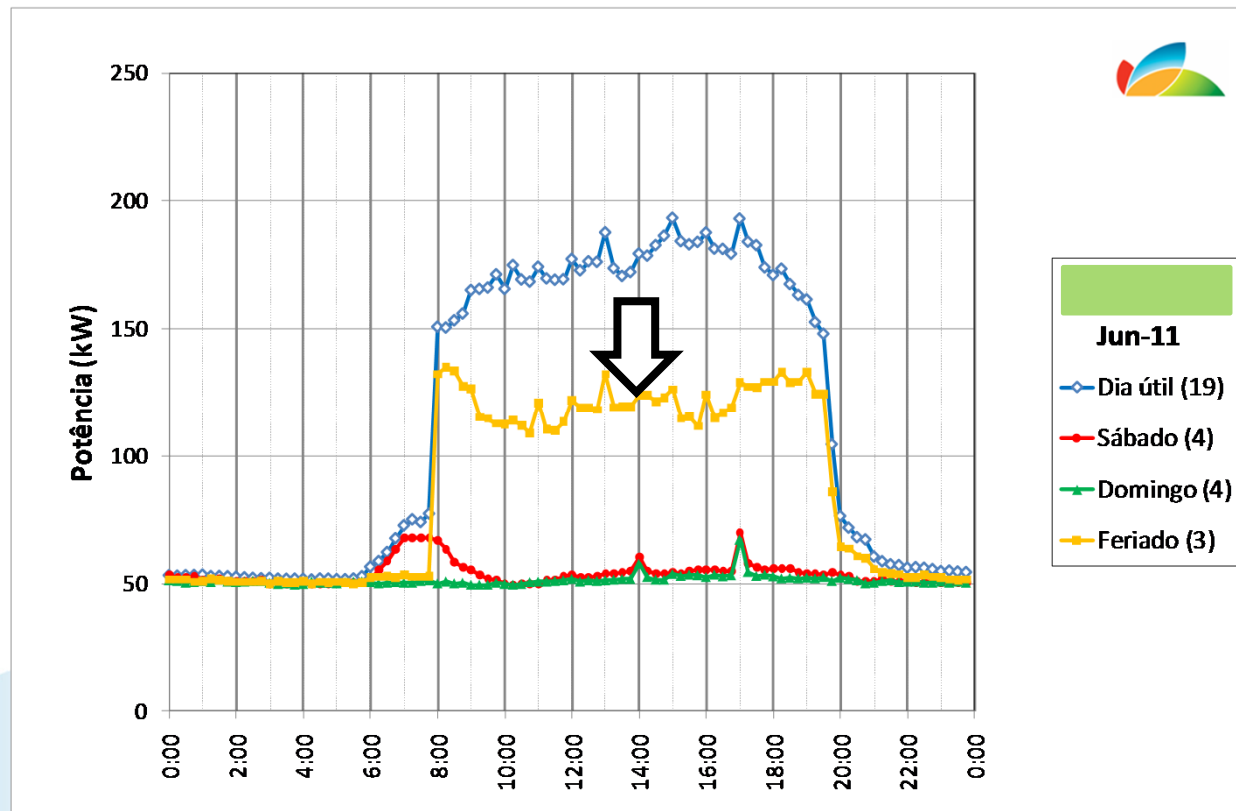
REMOTE MANAGEMENT – ANALYSIS



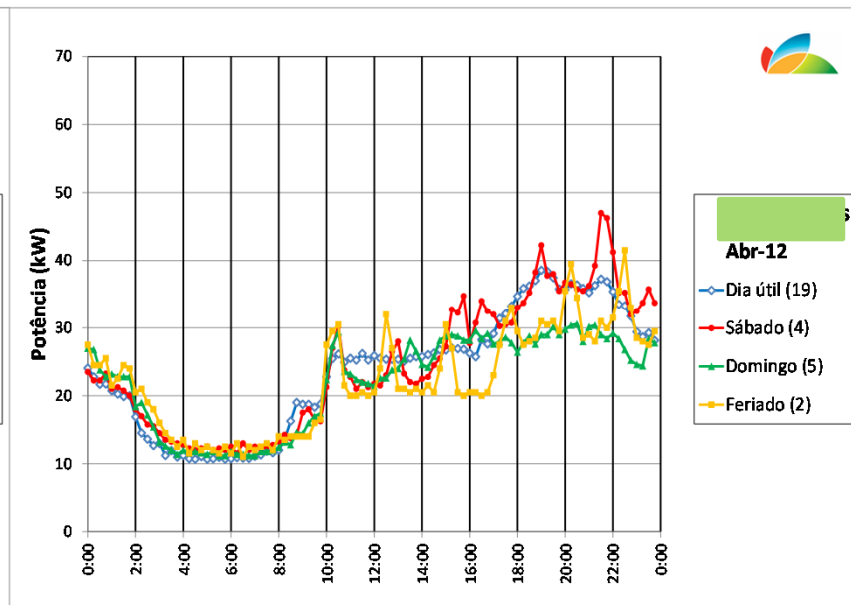
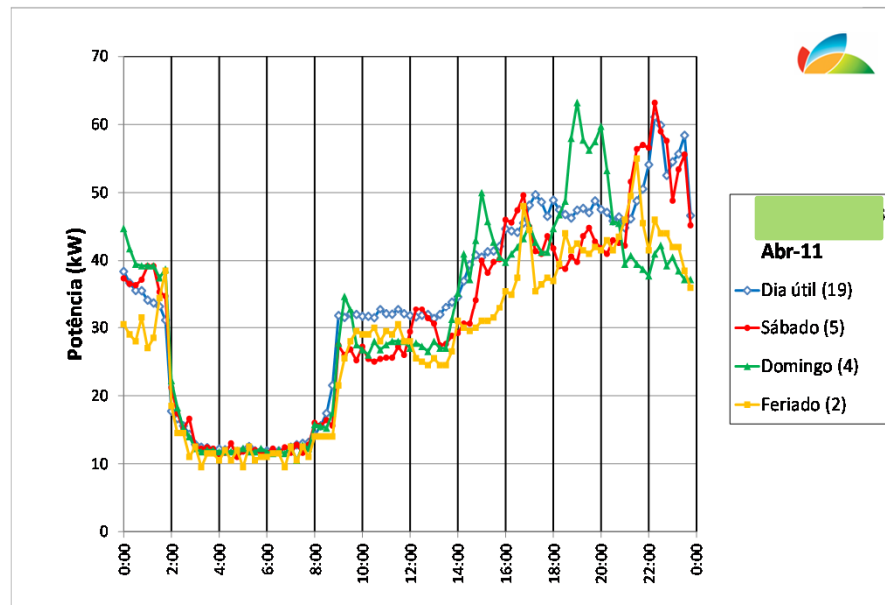
REMOTE MANAGEMENT – ANALYSIS



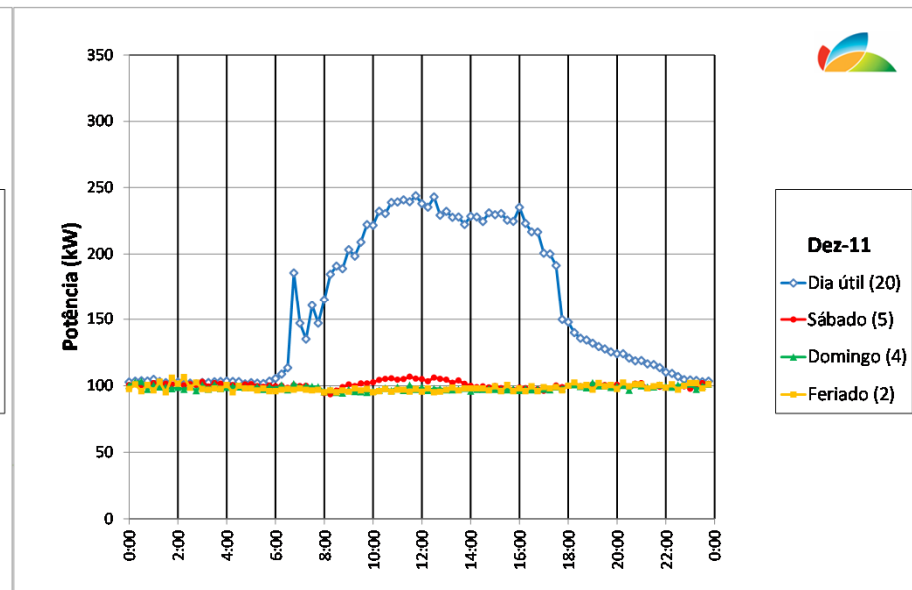
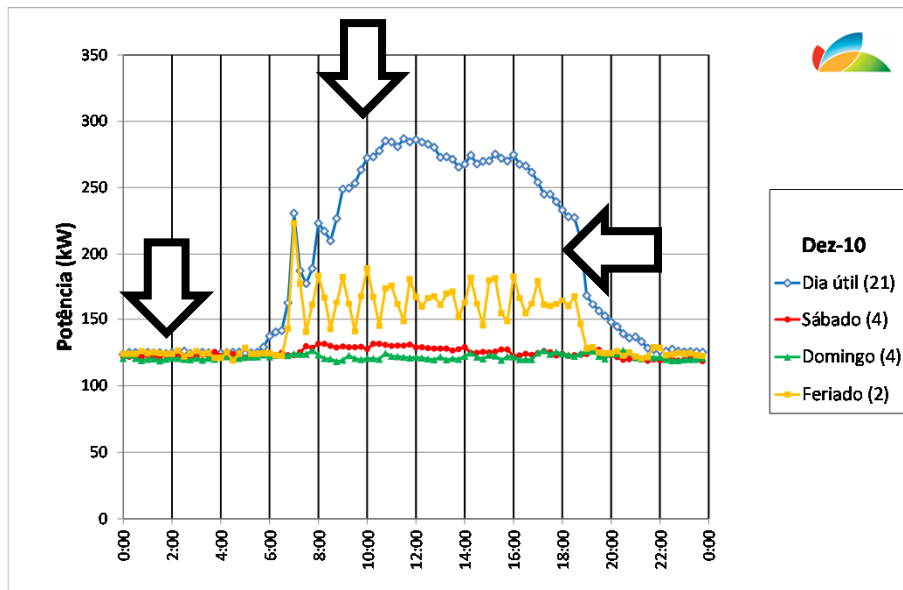
REMOTE MANAGEMENT – ANALYSIS



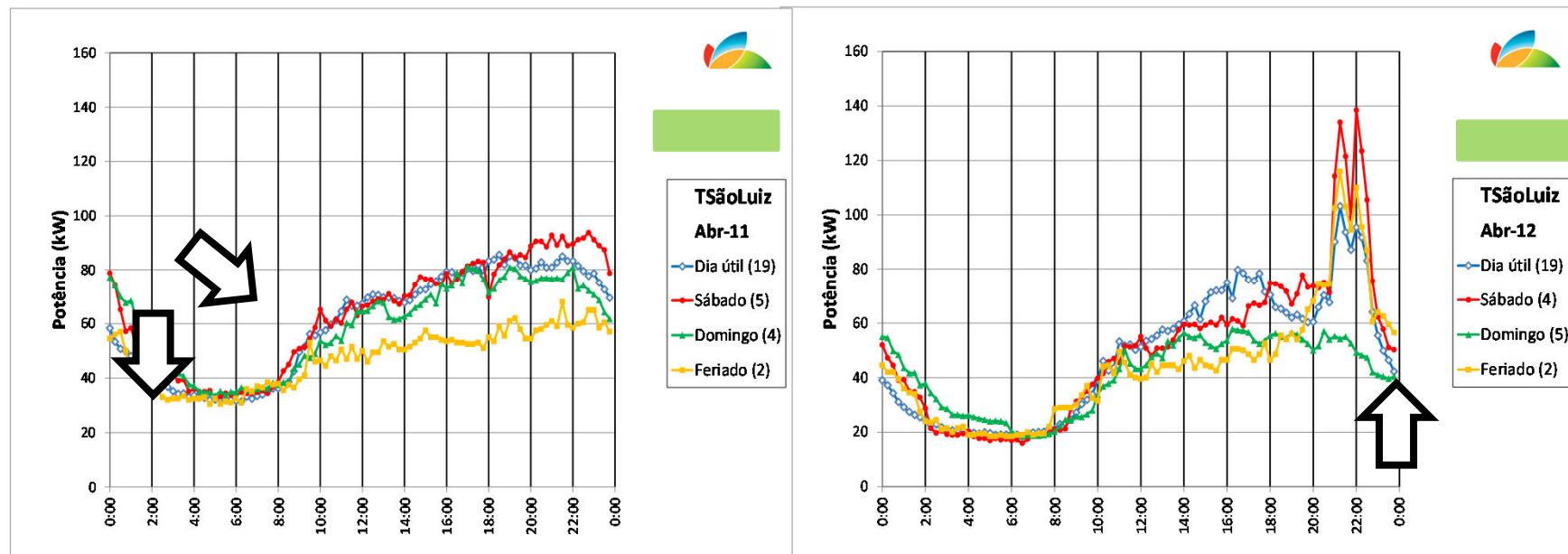
REMOTE MANAGEMENT – RESULTS (-28%)



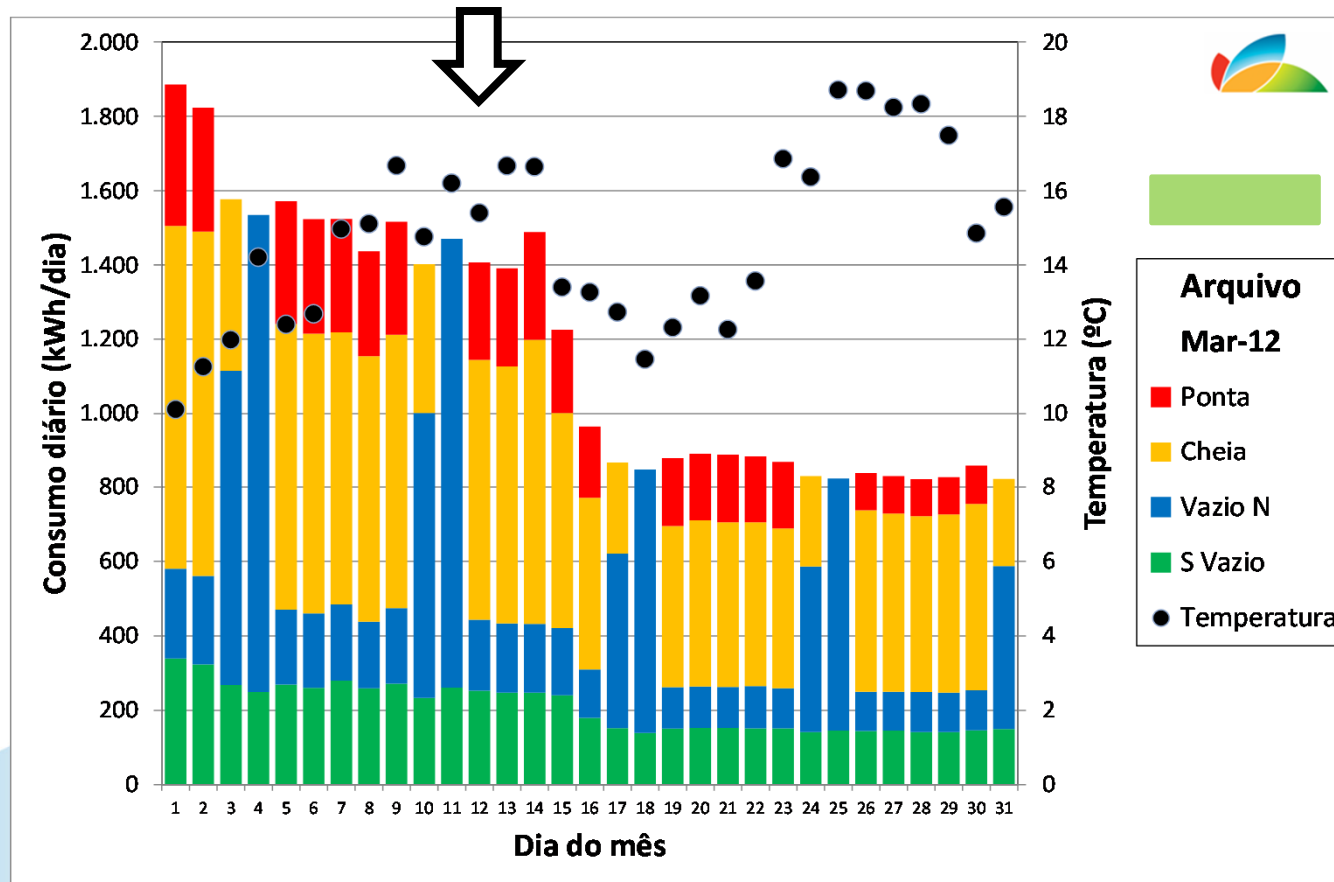
REMOTE MANAGEMENT – RESULTS (-20%)



REMOTE MANAGEMENT – RESULTS (-20%)



REMOTE MANAGEMENT – RESULTS (-29%)



THANK YOU

