

Overview of the Energy Policy in Portugal

EDP – Energy Planning Department

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Agenda

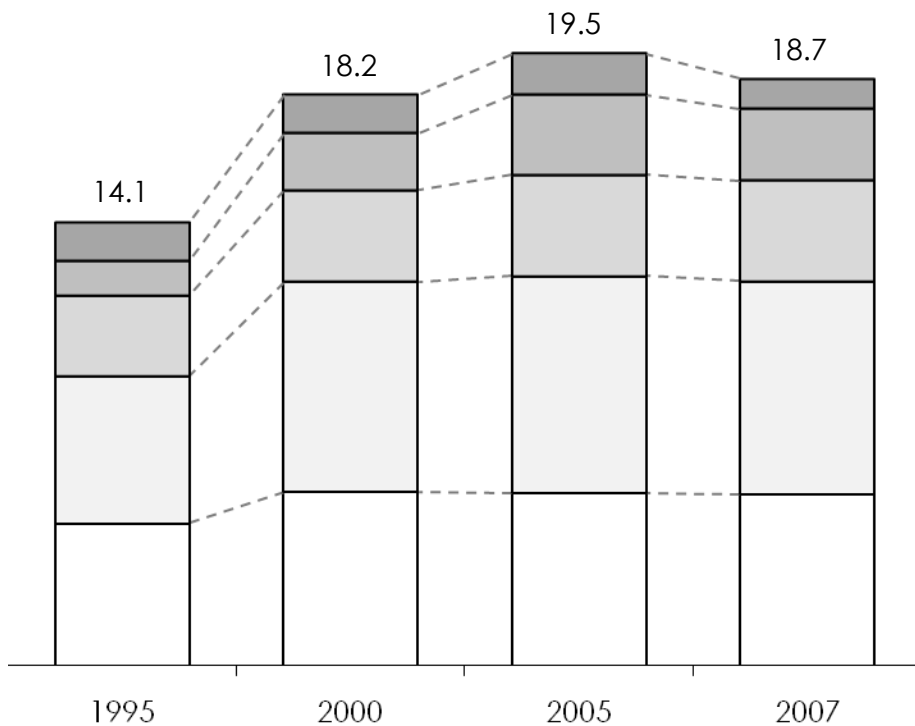
Overview of the Portuguese energy sector

Energy policy in Portugal

Conclusions

Final energy consumption is decelerating, having recently even decreased (economic slowdown and energy efficiency)

Evolution of final energy consumption, by sector
Mtoe



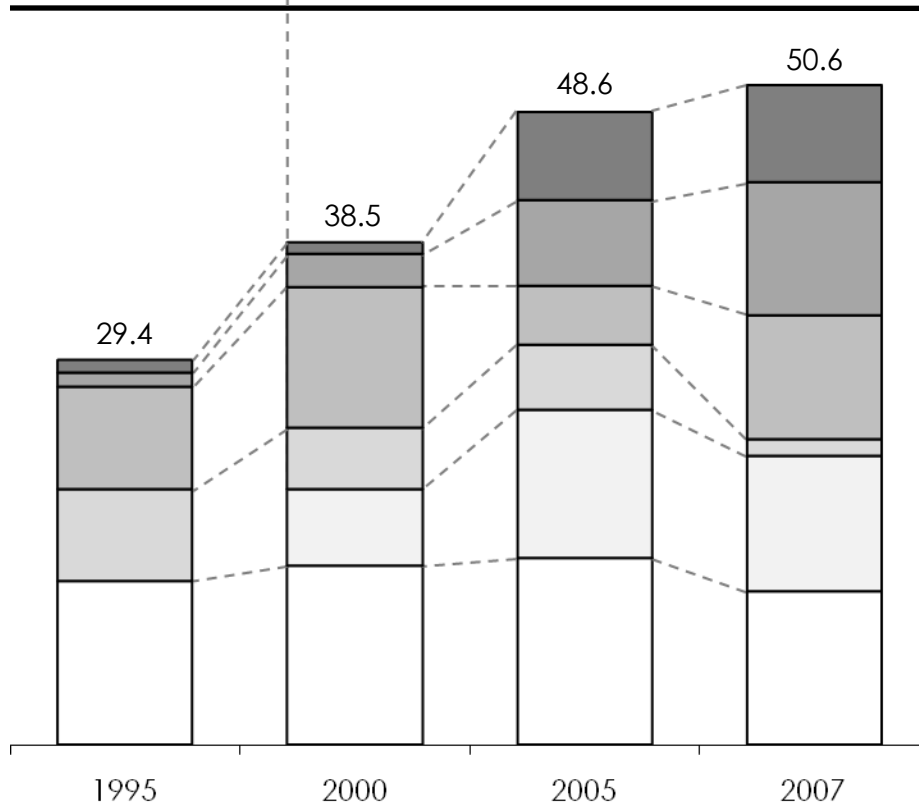
Compound annual growth rate
%

	'95-'00	'00-'05	'05-'07
Others	-0.4%	1.4%	-14.1%
Services	10.5%	6.9%	-5.3%
Residential	2.8%	1.9%	-0.4%
Transports	7.3%	0.7%	-0.7%
Industry	4.1%	-0.1%	-0.6%
GDP annual growth	5.2%	1.4%	-2.0%
	4.1%	0.6%	1.5%

Source: DGEG

Electricity consumption has maintained growth rates above final energy consumption

Evolution of electricity consumption, by source
Mtoe



Compound annual growth rate
%

	'95-'00	'00-'05	'05-'07
Net imports	0.3%	49.0%	4.7%
Special regime	17.1%	21.7%	24.0%
Hydro	6.6%	-16.1%	45.2%
Fueloil/Gasoil	-7.8%	1.2%	-49.4%
Natural gas	NA	14.1%	-4.0%
Coal	1.8%	0.9%	-9.7%
Total	5.5%	4.7%	2.0%

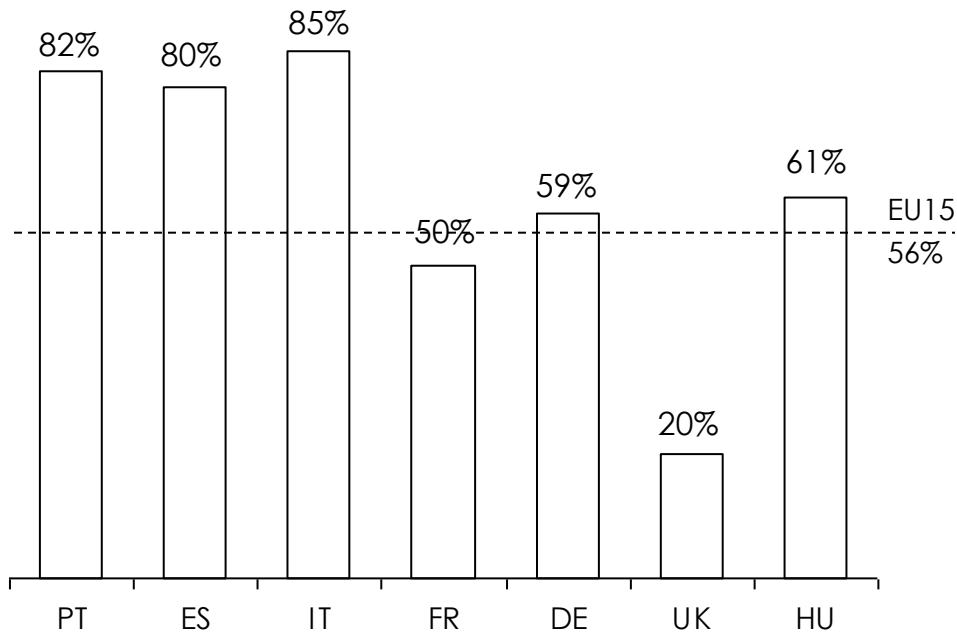
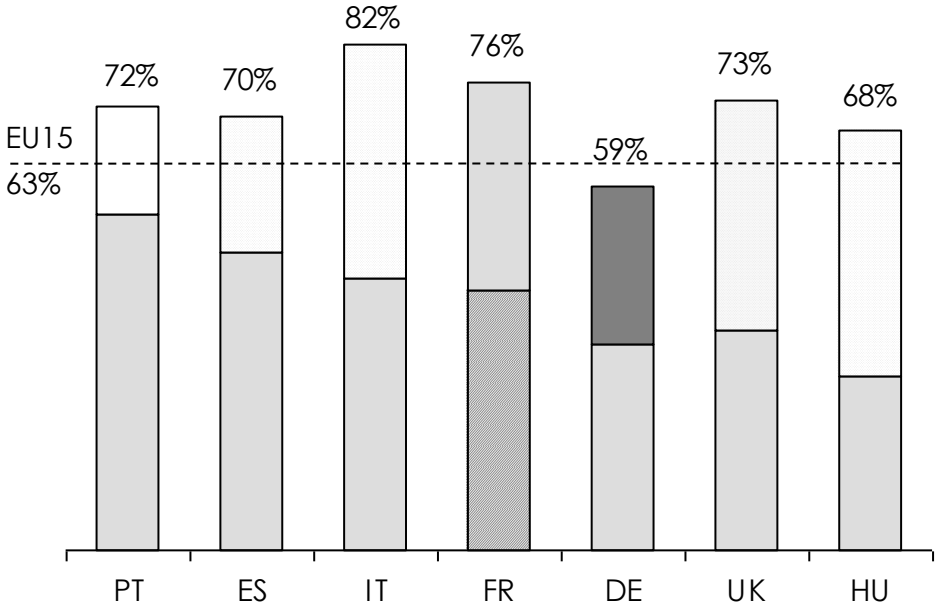
Technologies under the special regime category (mainly renewables) have the fastest growth rates

Portugal is in line with other European countries regarding fuel diversity, but has a higher dependency on imports

Weight of the top-2 fuel types on primary energy consumption
%, 2007

Share of imports in primary energy consumption
%, 2007

■ Nuclear ■ Oil ■ Coal ■ Gas ■ Renewables

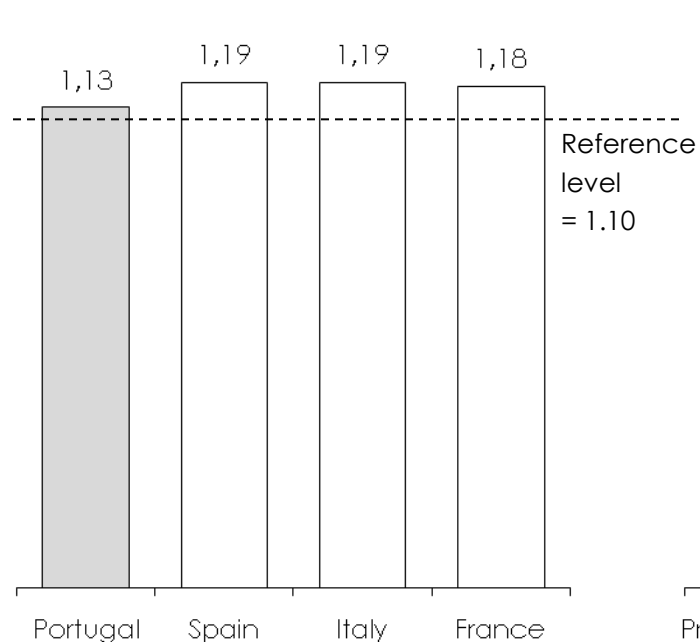


Source: Eurostat

The Portuguese power sector has a better performance in terms of security of supply than the energy sector in general

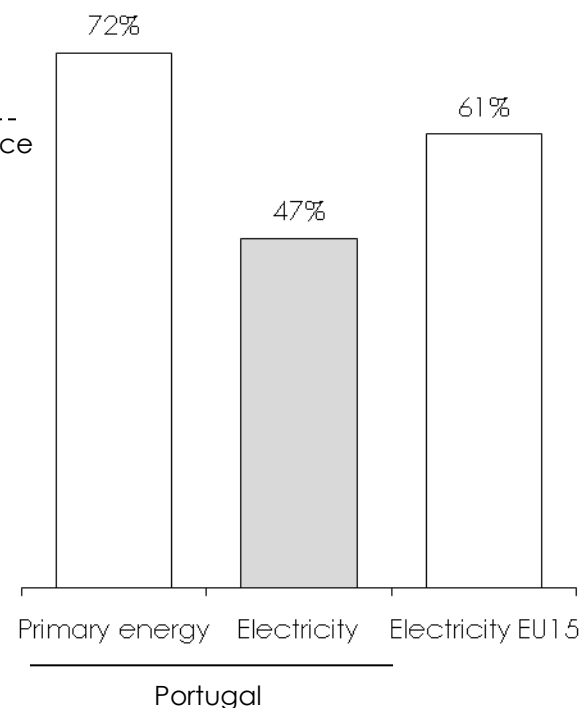
Reserve margin¹

#, 2008



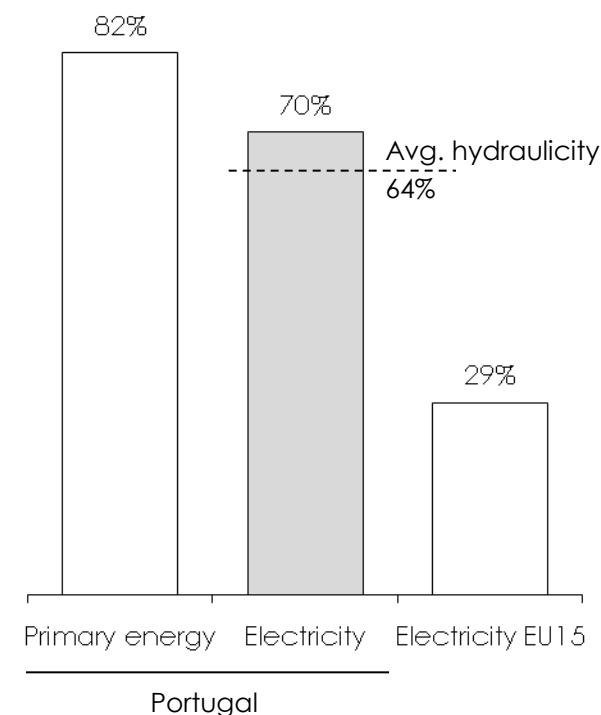
Weight of the top-2 fuels on consumption

%, 2007



Share of imports in consumption

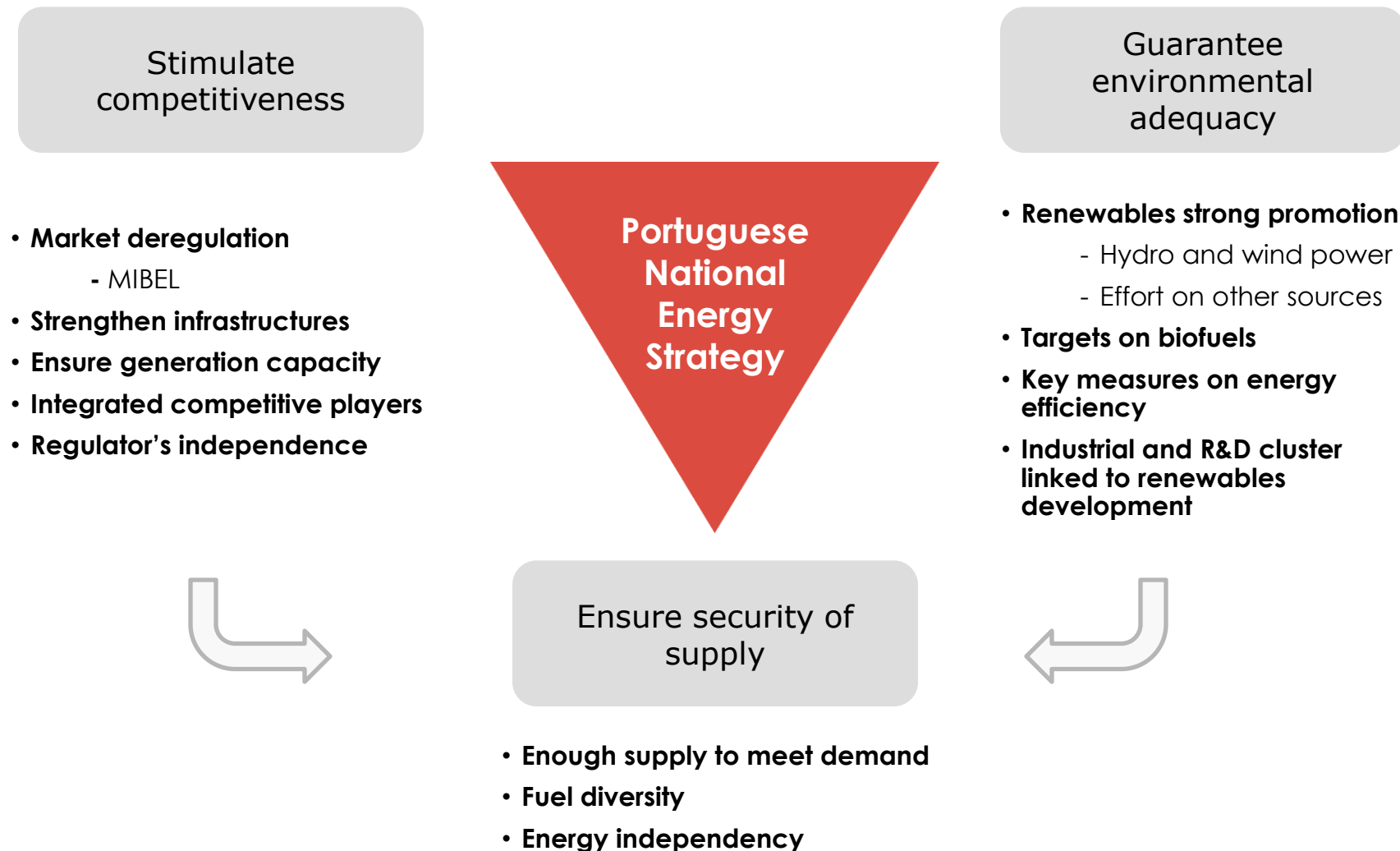
%, 2007



1. Reliably available capacity / (Margin against peak load + Load with or without DSM potential)

Source: UCTE (System Adequacy Forecast 2009-2020), Eurostat

Portuguese energy strategy is focused on improving security of supply through competitiveness and environmental adequacy



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Portugal has adopted a comprehensive policy that contribute to security of supply, competitiveness and sustainability

A

Promote renewable energies

- Reach 45% of renewables in electricity mix in 2010 and 60% in 2020
- Reach 10% in biofuels in 2010 and 10% of renewables in transports in 2020
- Replace 5-10% of coal with biomassa in coal-fired power plants

B

Increase hydro installed capacity

- Increase the explored potential from 46% in 2008 to 67% in 2020
- National plan for hydropower developments: 1,100 MW by 2020
- Under construction: Baixo Sabor, Ribeiradio and reinforcements at Picote, Bemposta and Alqueva

C

Increase CCGT installed capacity

- License 4 new CCGT plants with a total power of 3,200 MW

D

Reinforce interconnection capacity

- Increase interconnection capacity with Spain, with the objective of reaching 3,000 MW in 2014

E

Increase energy efficiency

- Implement the National Action Plan for Energy Efficiency (PNAEE) with the objective of reducing 9.8% of final energy consumption by 2015

F

Promote the electric vehicle

- Promote electric mobility (Mobi.E)

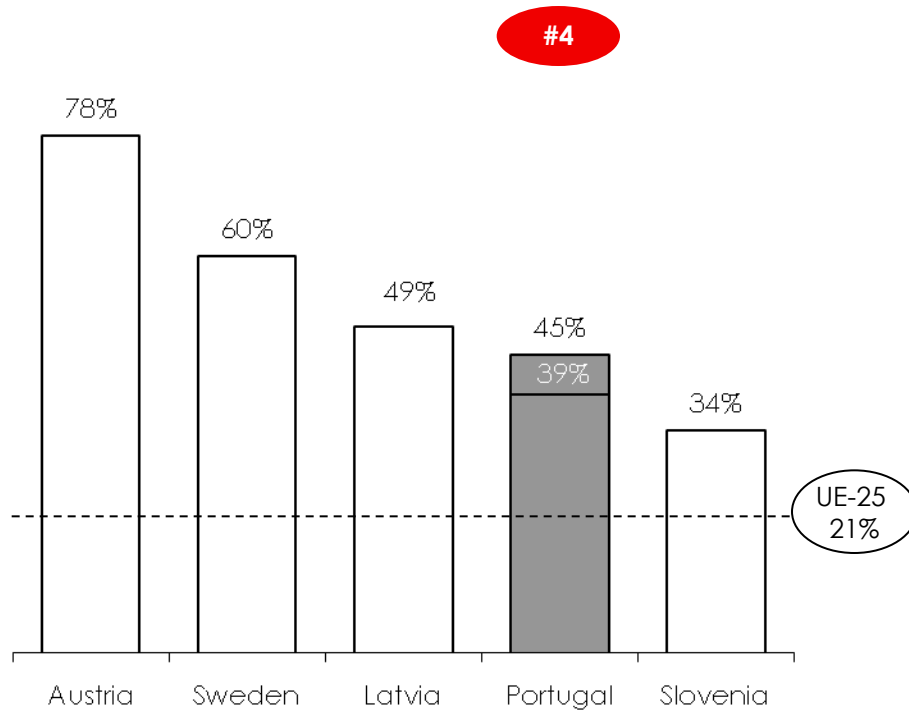
Portugal has taken a leadership role in the development of renewable energy sources

A

x Ranking of Portugal

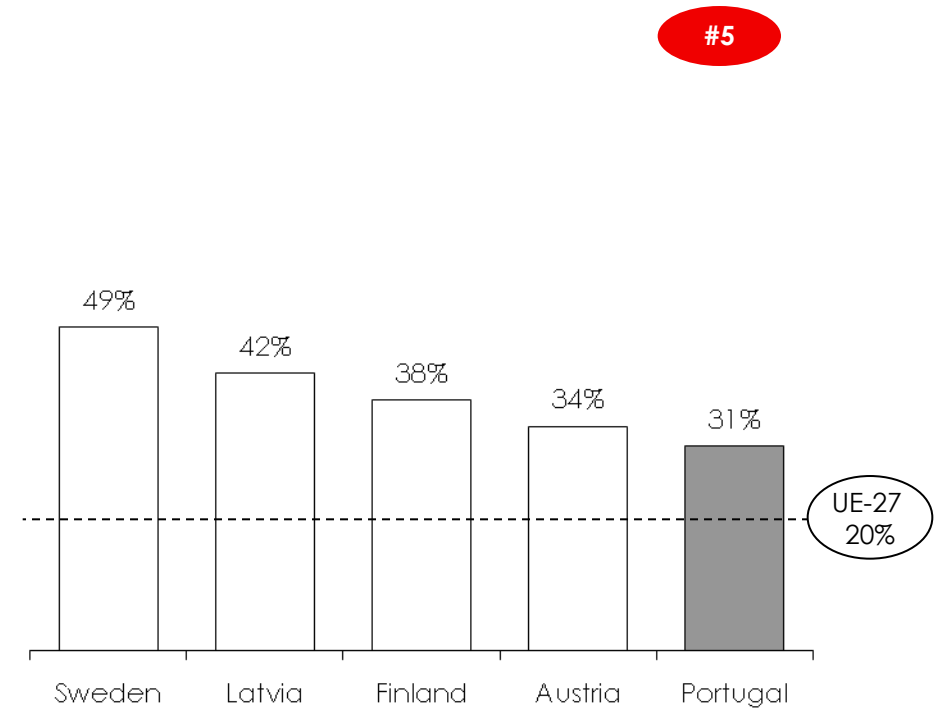
Renewables target for 2010

% of renewables in gross electricity consumption



Renewables target for 2020

% of renewables in the gross final energy consumption



The Portuguese Government has revised its renewable energy policy to more ambitious targets for 2010

A

	Initial targets	Targets '10	Description
Wind	3,750 MW	4,700 MW + 450 MW	<ul style="list-style-type: none"> Additional capacity of 450 MW through upgrades in existing facilities Create industrial clusters associated with two launched bids Launch bids to grant 200 MW of installed capacity to small promoters
Hydro-power	5,000 MW	5,575 MW + 7,000 MW (2020)	<ul style="list-style-type: none"> Support investment in hydropower and pumping capacity reinforcement <ul style="list-style-type: none"> anticipate two capacity reinforcements/upgrades projects and duplicate current Alqueva's hydro plant capacity until 2010/11
Biomass	150 MW	250 MW	<ul style="list-style-type: none"> Create decentralized network of biomass plants (~15 new plants) Close cooperation with regional forest resources and with fire-risk mitigation policies
Solar	150 MW	150 MW invest in MG ¹	<ul style="list-style-type: none"> Build largest photovoltaic plant in the world Mandatory installation of thermal solar panels
Wave	50 MW	Pilot area with 250 MW	<ul style="list-style-type: none"> Create Pilot Area with exploration potential up to 250MW Promote industrial and pre-commercial technological development with prototype installation in emerging technologies
Biofuels	No goals	10% road transportation fuels	<ul style="list-style-type: none"> Reinforce bio-fuels goals (5.75% -> 10%)² ISP³ exemption for road transportation fuels and domestic agricultural incorporation Launch new bid during 1st semester of 2007
Biogas	No goals	100 MW	<ul style="list-style-type: none"> Create residue anaerobic treatment units Resolution of environmental problems, namely "Ribeira dos Milagres"
Micro-generation	No goals	50,000 roofs	<ul style="list-style-type: none"> "Instant Renewables" – simplified system for micro photovoltaic and wind power Program to install 50,000 systems until 2010, with incentive for installation of Solar Hot Water in existing households

Source: Ministério da Economia e da Inovação – Energy Policy (2007)

1. MG – Micro-generation; 2. Bring forth European Union goal by 10 years; 3. Fuel tax

To promote renewables, Portugal has an incentive scheme based on feed-in tariffs

A

Overview of key legislation aspects

DL 225/2007

Remuneration value for first year of operation

Constant in nominal terms (decreasing in real terms)

Yearly indexation

Inflation

Scheme duration

From 10/15 (most technologies) to 20 years (mini-hydro) and 25 years (biomass)

Remuneration at the end of defined scheme

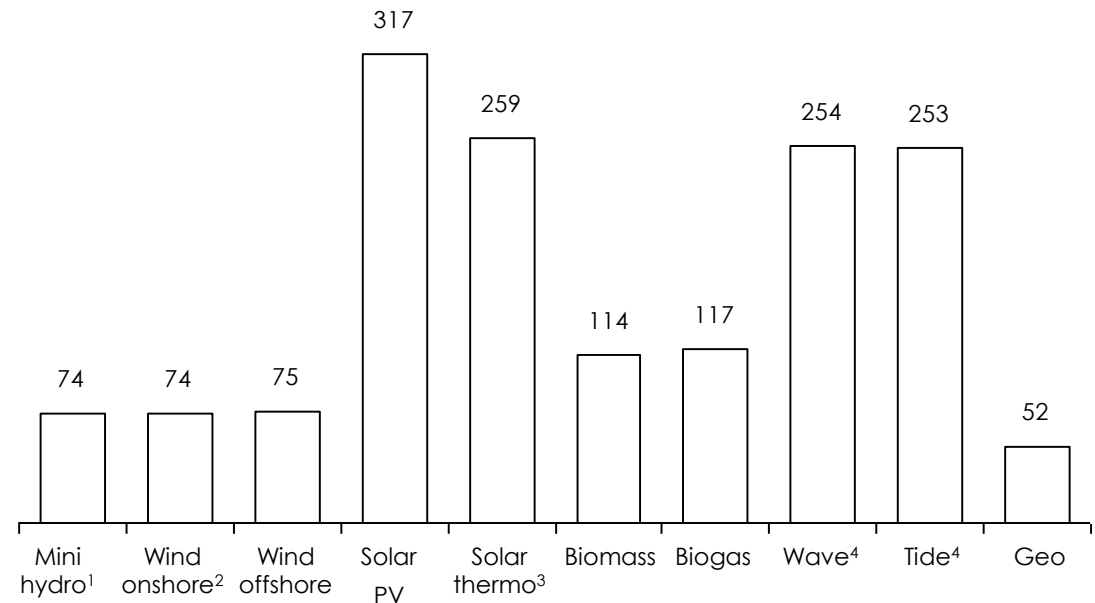
Pool price + guarantee of origin (if already developed)

Applicability

New projects licensed after February 2006

Estimated tariffs for RES-E in PT for 2009 (1st year of operation)

€/MWh



Source: DL 225/2007; DPE Analysis

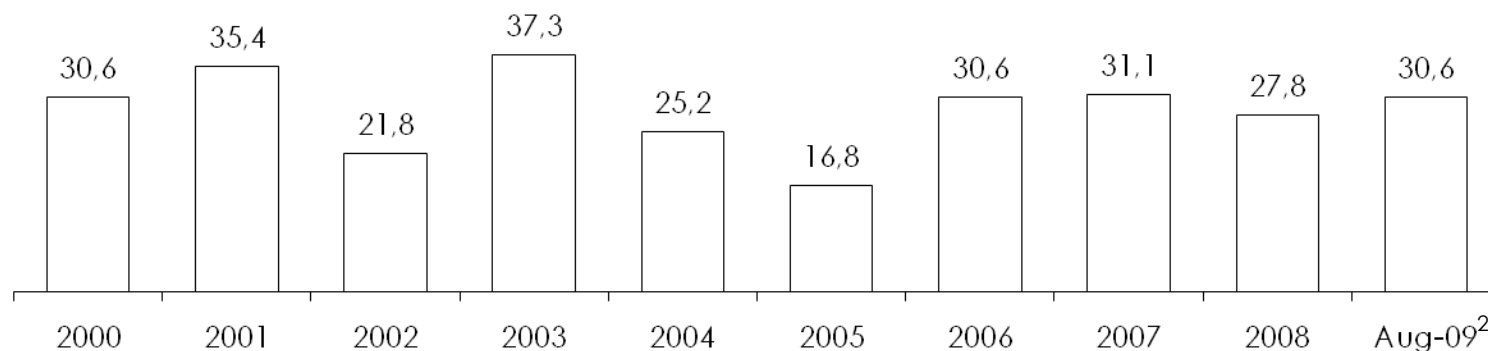
1. Assuming 3,200 working hours; 2. Assuming 2,100 working hours; 3. Tariff applicable to installations with less than 10MW capacity; 4. Tariff goes from ~250€/MWh in 2008 (demonstration model) to ~75€/MWh in 2016 (commercial model)

Portugal is on track to meet its renewables objective for 2010, having already surpassed the 45% target

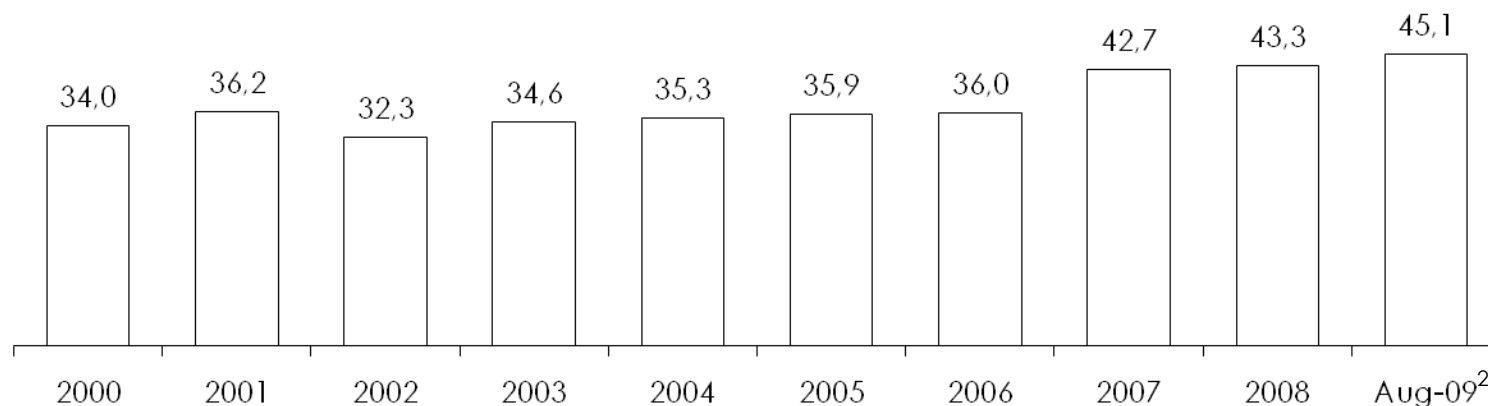
A

Share of renewables in gross electricity consumption in Portugal
%

Renewable share
(Real)



Renewable share
(Directive¹)



1. The share of renewables for compliance with the indicative target set for 2010 is calculated assuming the same hydraulicity index of the base year (1997)

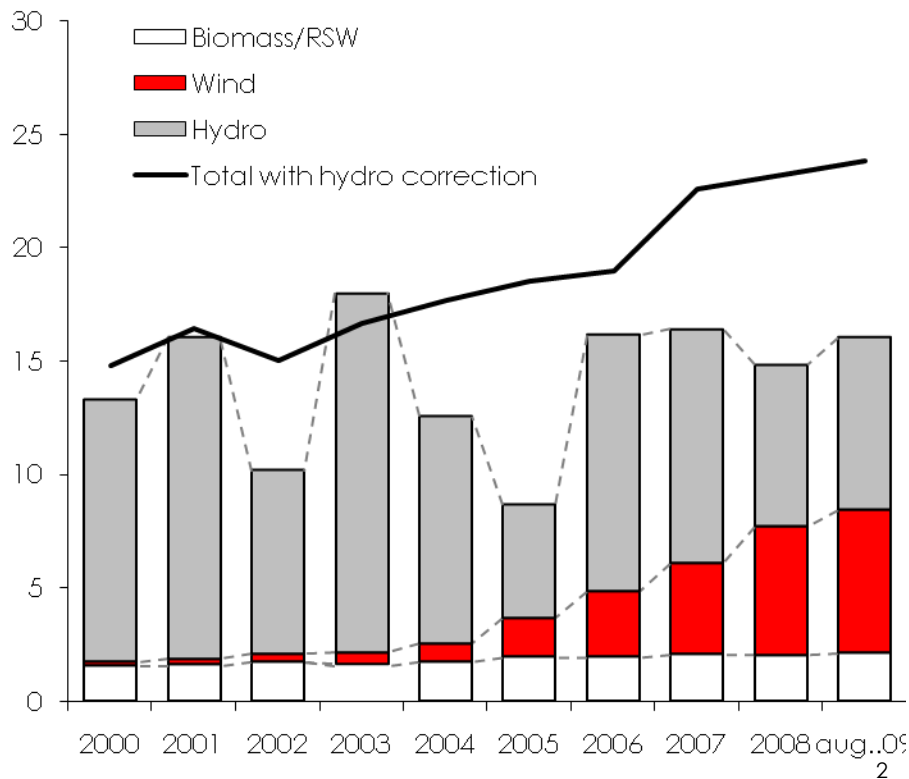
2. Moving year from September 2008 to August 2009

Source: DGEG – Estatísticas rápidas sobre renováveis

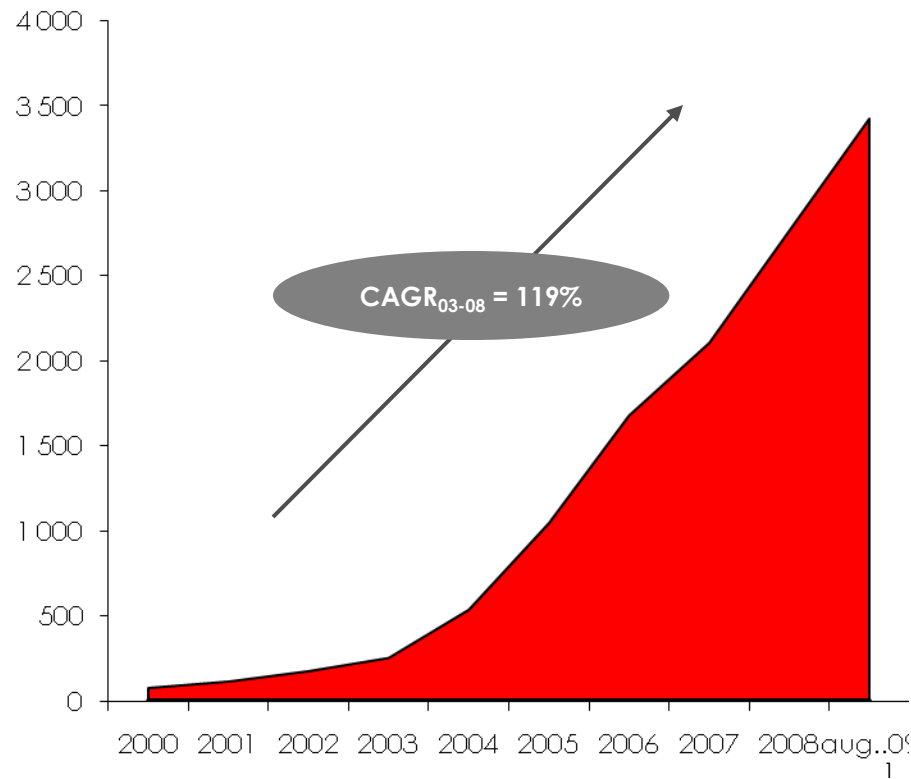
Wind power has been the renewable technology with the fastest growth rate in recent years

A

Electricity generation from renewables
TWh



Installed wind power capacity
MW



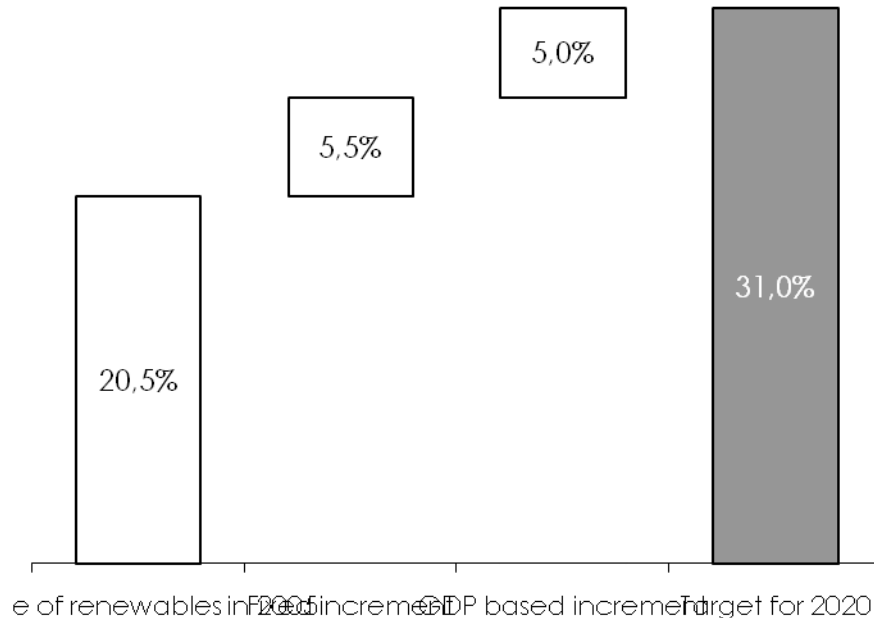
1. Moving year from September 2008 to August 2009
Source: DGEG – Estatísticas rápidas sobre renováveis

For 2020, Portugal will most likely have to reach a share of 60% of renewables in the electricity mix

A

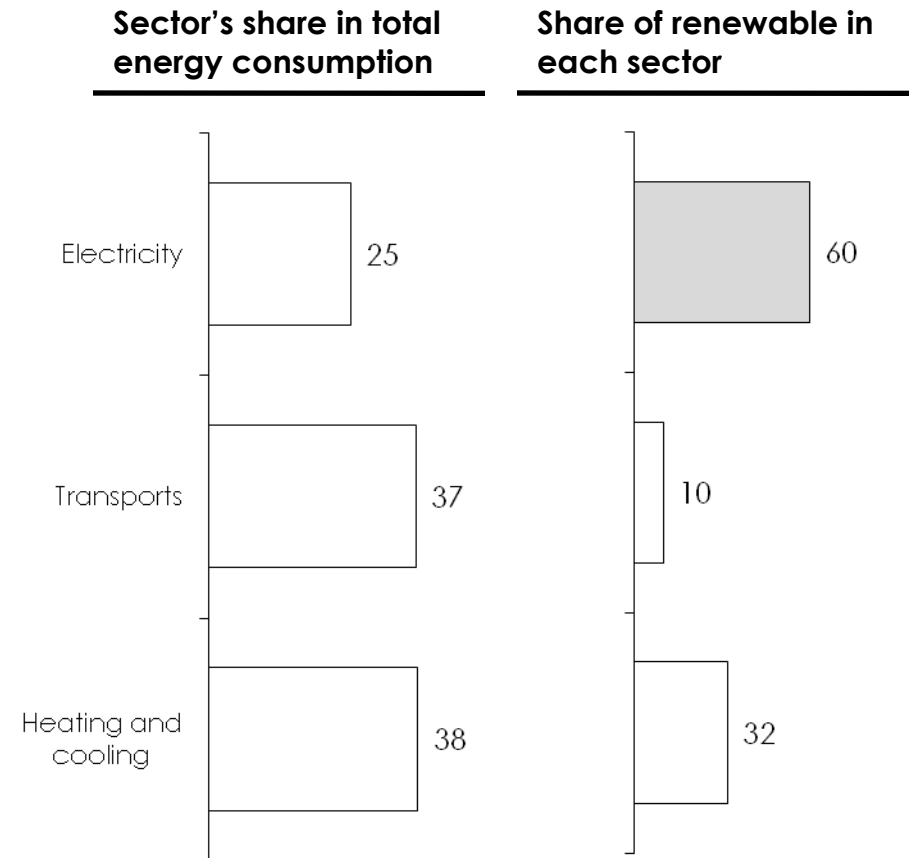
Renewables target for Portugal in 2020

Share of renewables in gross final energy consumption



Forecast of final energy profile for Portugal in 2020

%



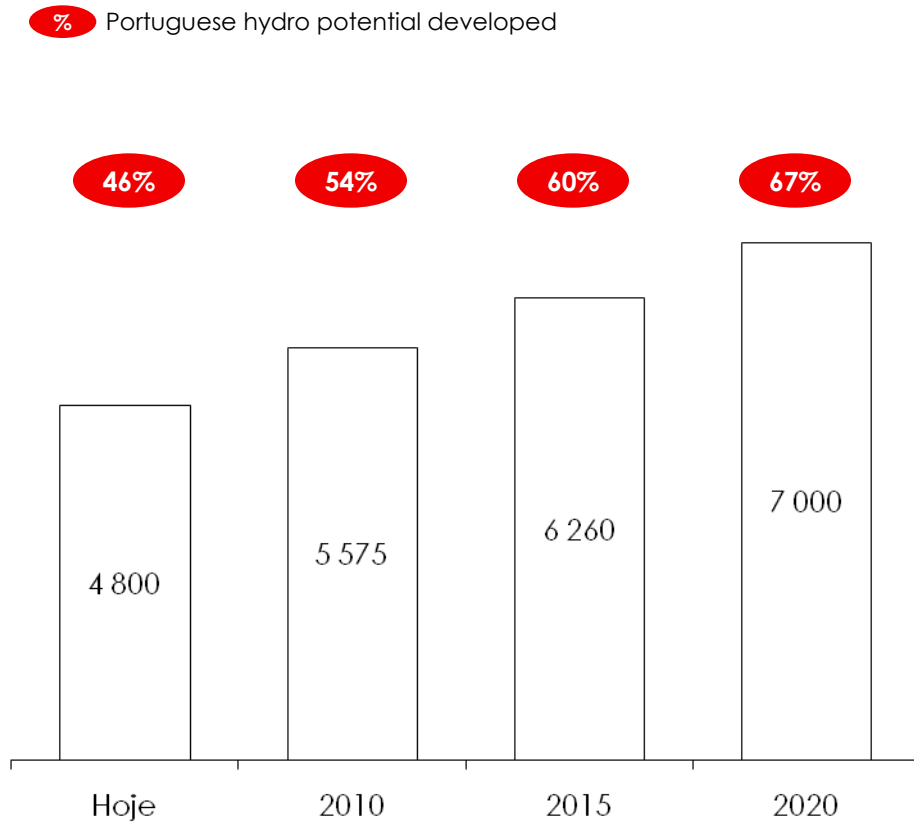
Source: COM(2008) 19 final 23Jan08; European Energy and Transport – Trends to 2030, update 2007

Untapped hydro potential is set to be a key generation capacity growth driver in Portugal for the next 10 years

B

Hydropower installed capacity

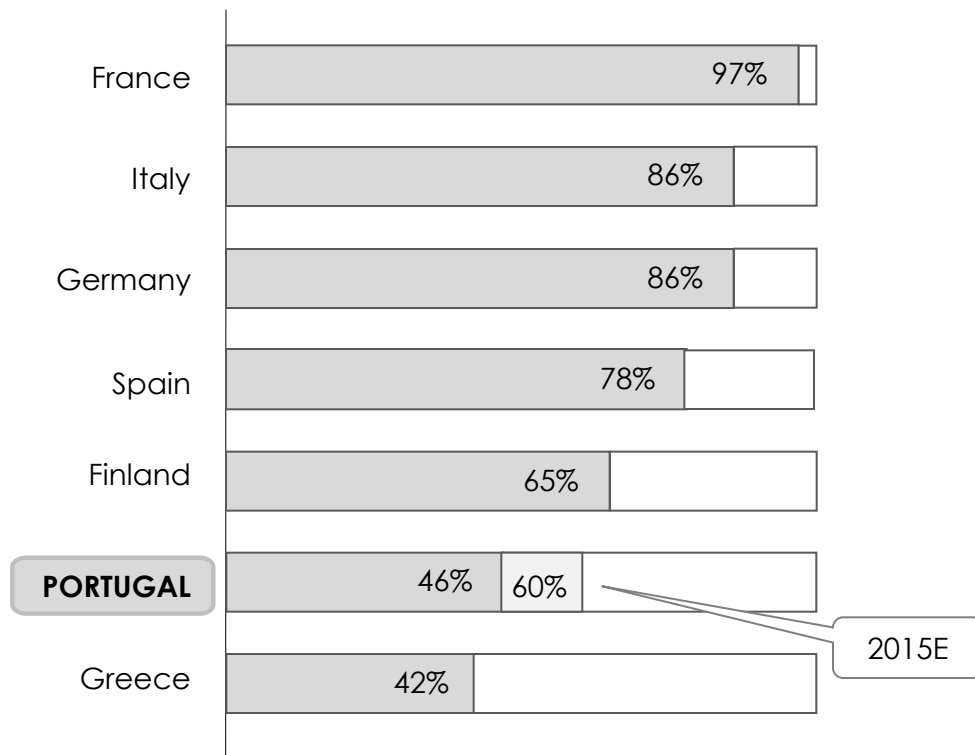
MW



Developed hydro potential in Europe

%

□ Hydro potential available □ Hydro potential developed



Source: Ministério da Economia e da Inovação – Energia e Alterações Climáticas (2007)

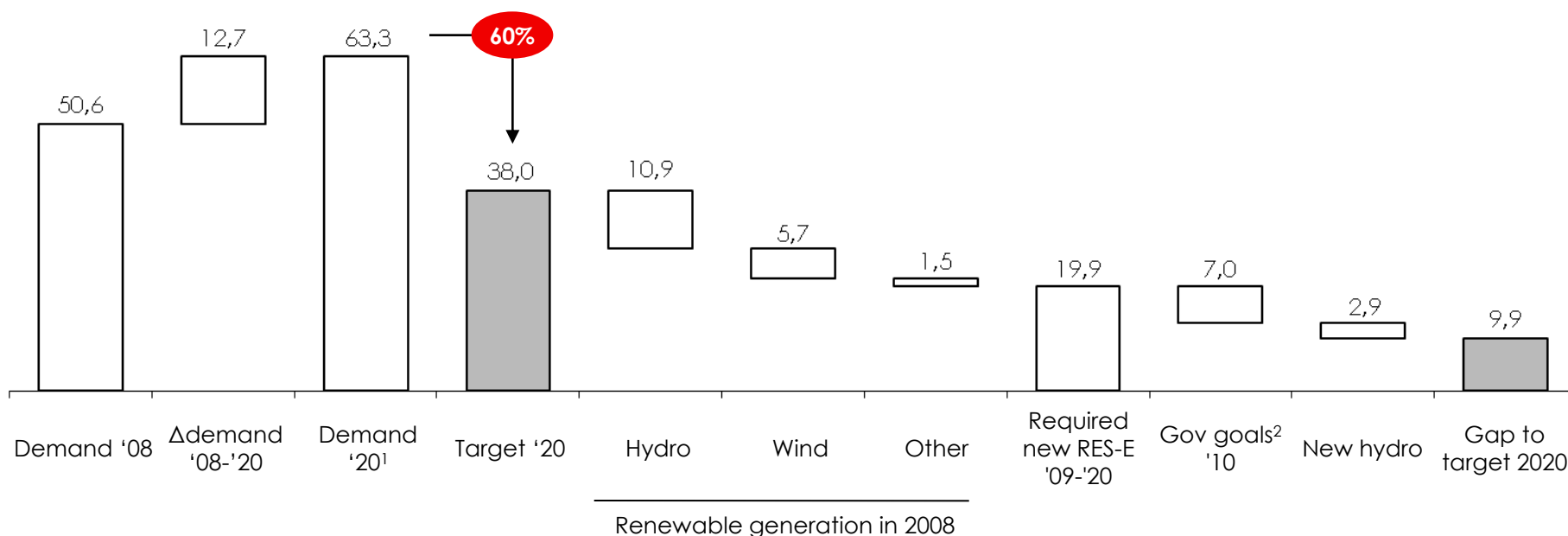
Hydro contribution is key to achieve Government's goal of 60% by 2020

A

B

Portugal's progress towards achieving 2020 EU renewable targets implied for the electricity sector

TWh



The recently elected Government aims at assuring a leadership position of Portugal in terms of renewables and has already announced the objective of reaching **8,500 MW of wind** power and **1,500 MW of solar** by 2020

1. Low demand scenario assumed for Demand growth; 2. Assumed working hours of 2.200h and 3.000h for wind and other renewables, respectively
Sources: Internal information; XVIII Government's program

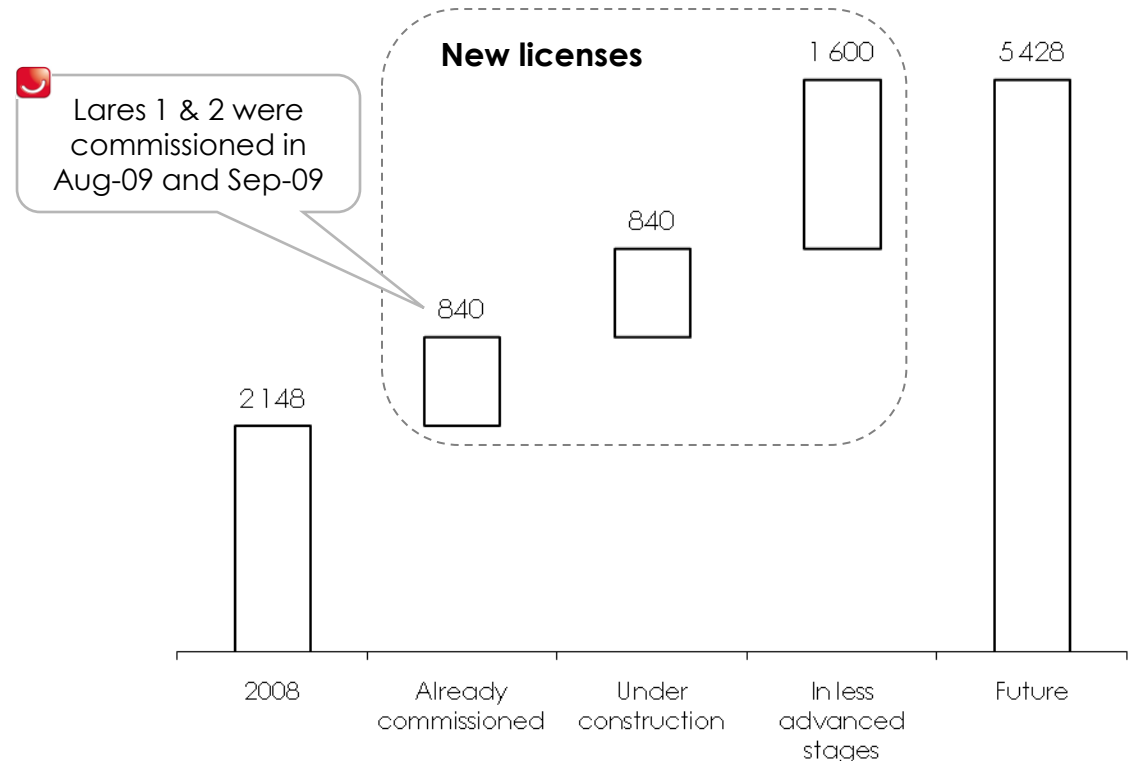
Regarding conventional thermal power, the Portuguese Government has licensed ~3,200 MW of new CCGT

C

CCGT is the preferred conventional technology

- Higher environmental performance
- Reduced time-to-market
- Higher economic attractiveness
- Lower initial investment
- Lower financial risk against market prices and CO₂

Installed CCGT capacity in Portugal MW

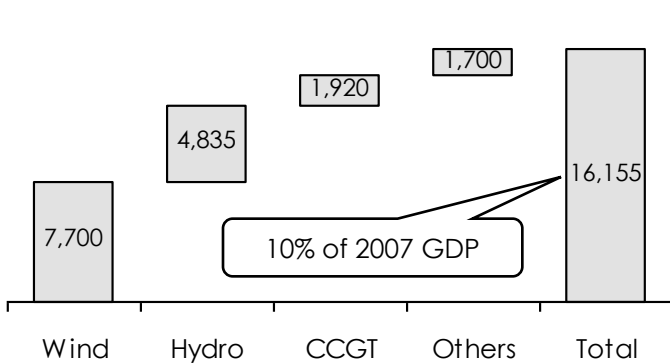


EDP was awarded 2 out of the 8 licences (Lares 1 and 2) and has already committed both units

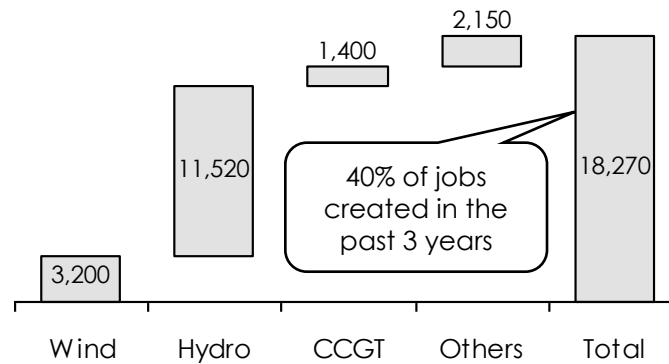
The bet on renewables and CCGT is promoting investments, creating jobs and enabling regional development

A B C

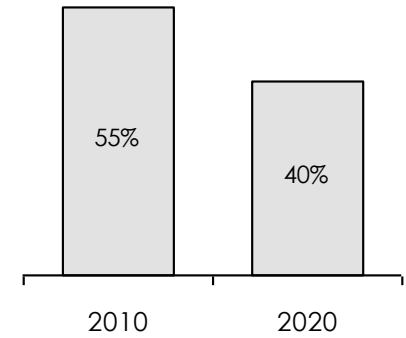
Investments
M€



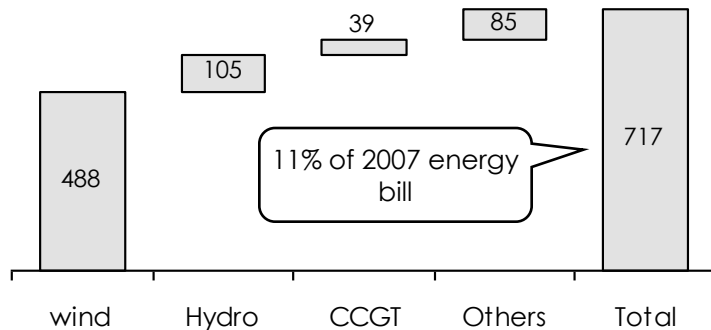
Job creation
New direct job creation



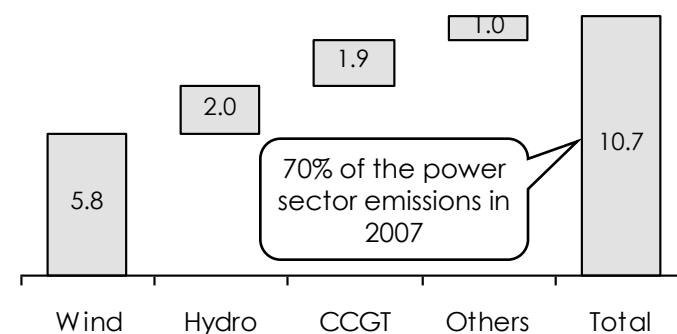
Energy dependency of the power sector



Direct savings from fuel and CO₂¹
M€



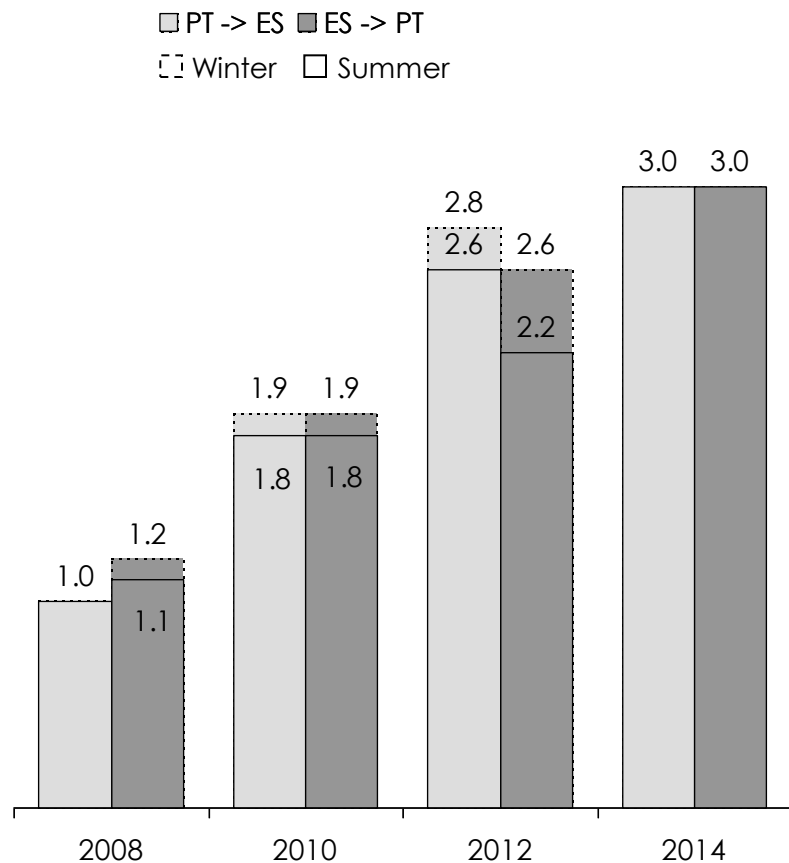
Directly avoided CO₂ emissions²
Mton/ano



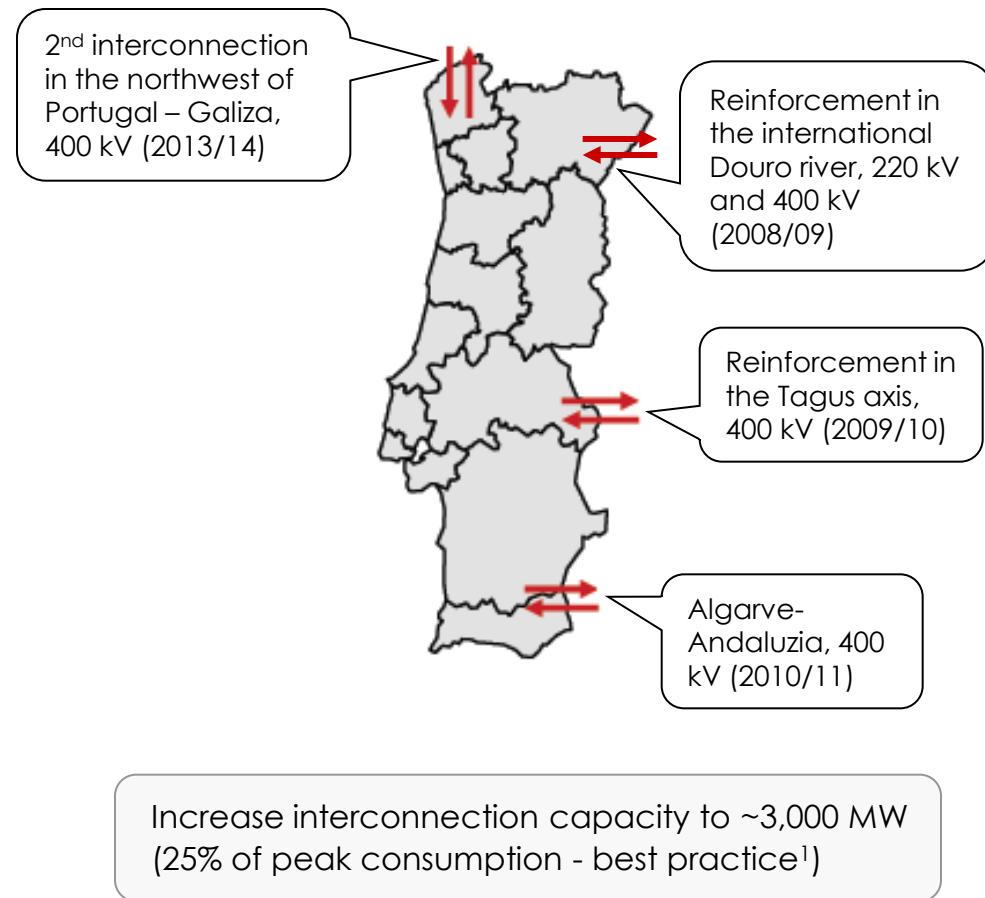
1. Assuming Brent at 70 \$/bbl, coal at 70 \$/ton, CO₂ at 20 €/ton; 2. Assuming an emission factor of 0.5 ton/MWh

The increased interconnection capacity is essential for market integration and to promote large integration of renewables

D Interconnection capacity between Portugal and Spain (GW)



New projects planned up to 2012



Source: REN, Plano de Desenvolvimento e Investimentos da RNT 209-2014 (2019 – Consulta Pública (Feb08)

1. EU recommends that the interconnection capacity represents 10% of the peak demand of the smallest of the interconnected systems

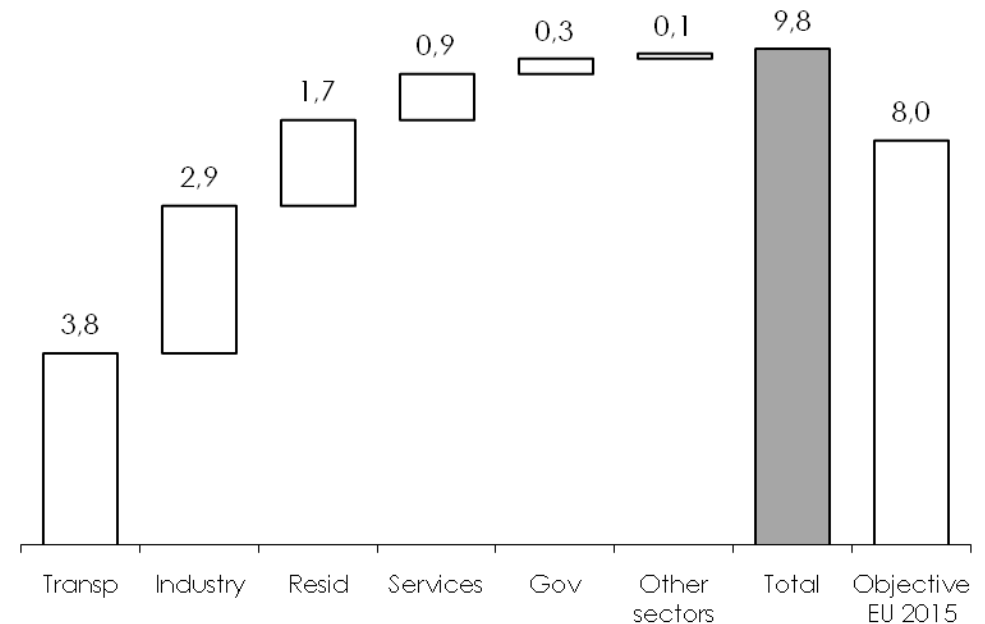
Regarding energy efficiency, the Government has launched a program with a savings target of 9.8% by 2015

E

Energy Services Directive Directive 2006/32/CE

- 1% per year saving from start of 2008 to end of 2016
- Final energy saving vs. '01-'05 national average
- Member states obliged to submit national plans
 - PNAEE¹ in Portugal
- Non-binding target

PNAEE estimated savings, by sector %



Portuguese objective is 20% above the target set by the European Directive for 2015

¹. National Action Plan for Energy Efficiency
Source: PNAEE

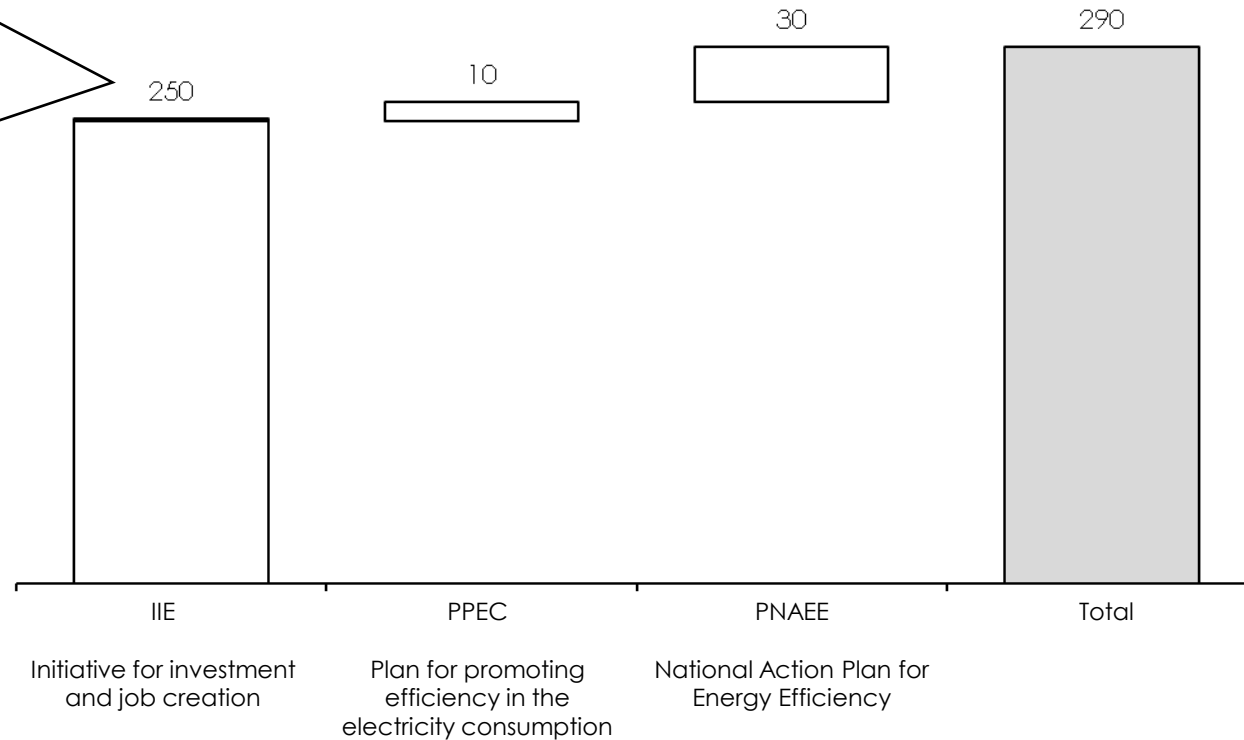
In 2009, public funds allocated to energy efficiency measures amount to €290M

E

Public funds for investments in energy efficiency in 2009

€M, 2009, by supporting mechanism

- Part of a €2,180M economic stimulus package:
 - €1,300M directly from the Government's Budget
 - €880M of EU funds
- €250M allocated to Sustainable Energy (mainly to promote micro-generation and energy efficiency measures in the public sector)

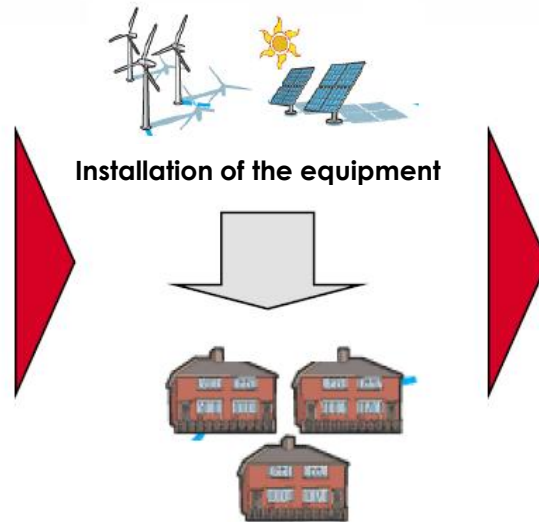


One of the measures adopted under PNAEE is a simplified system for renewable micro-generation (“Instant Renewables”)

E



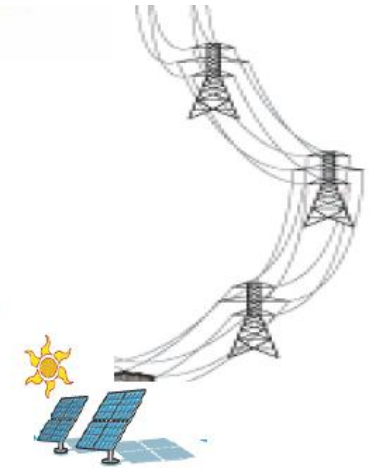
Online registration



Installation of the equipment



Inspector grants Certification



Starts selling power to the grid

Registration system:

- Identifies electricity client number
- Installed capacity up to 50% of contracted power and 3.68 kW

- Micro-PV, or
- Micro-wind, or
- Micro-hydro, or
- Cogeneration with biomass, or
- Fuel cells
- +
- Solar thermal

- Inspection occurs up to 4 months after registration
- Registration system grants certification to use the equipments

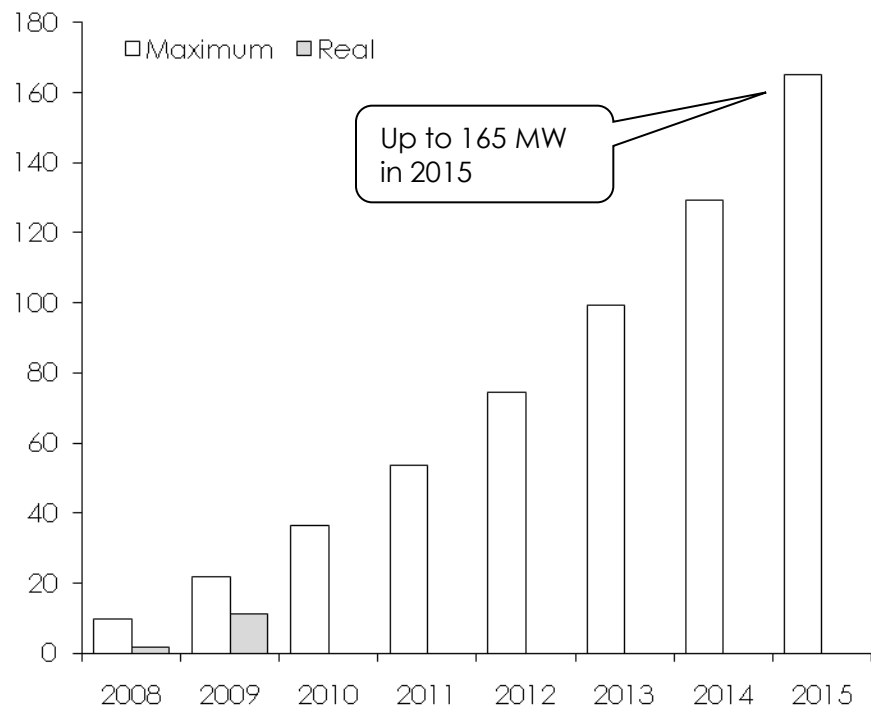
Contract is signed with the retailer to start selling power to the grid

- Up to 75% of the revenues can go directly to the bank to finance the investment

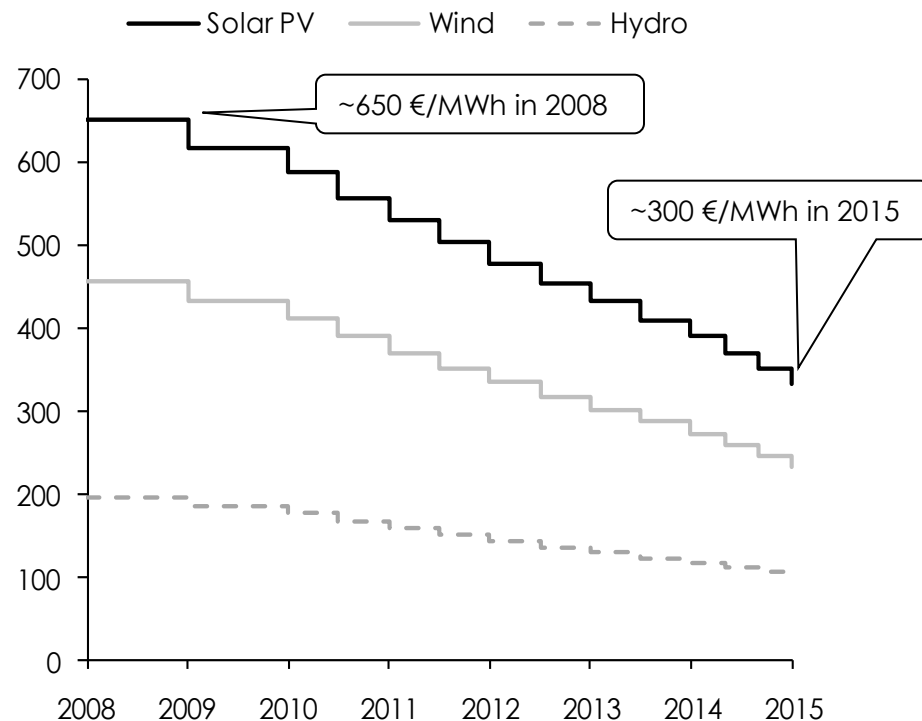
With “Instant Renewables” the Government expects to reach 165 MW of micro-generation by 2015

E

Maximum allowed installed capacity
MW



Evolution of the reference tariff
€/MWh, scenario of maximum installed capacity



- Maximum installed capacity increases 20%/year
- Tariff valid in the construction year is guaranteed for the first 5 years; after that, the tariff of the corresponding year applies

The Government is promoting the adoption of the electric vehicle through the Electric Mobility Program (Mobi.E)

F

What is the Electric Mobility System?

An integrated network between several points existing in national territory boosted by the management entity Mobi.E which shall allow the supply of electric vehicles by way of a charging card

Where are the supply points located?

- At private garages
- At public access points (car parks, shopping centres, hotels, airports, petrol pumps and on the public highway)



How can the electric vehicle be supplied?

- Overnight, taking advantage of the energy produced by renewable sources at times of lower consumption
- By way of rapid charging during the day in accordance with the needs of the user

 **SLOW CHARGING:** 6 to 8 Hours

 **FAST CHARGING:** 20 to 30 minutes

How is supply processed?

By way of a pre-paid card CHARG.E of the Mobi.E network which shall provide them with access to the supply points, discounting the charging value



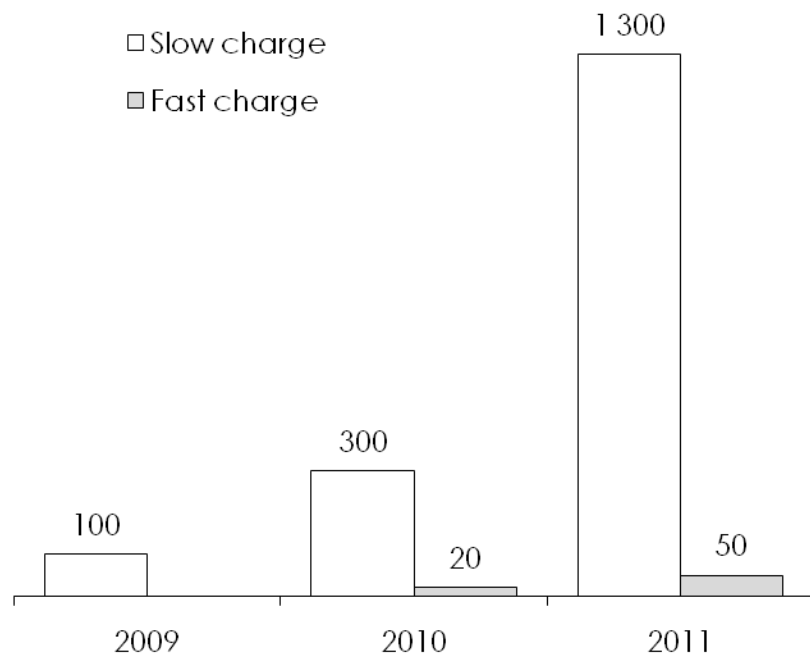
Portugal is in the front run in the development and adoption of new energy models for mobility

In a mature phase, smartgrids and two way charging will allow electric vehicles to sell energy stored in batteries to the grid

F

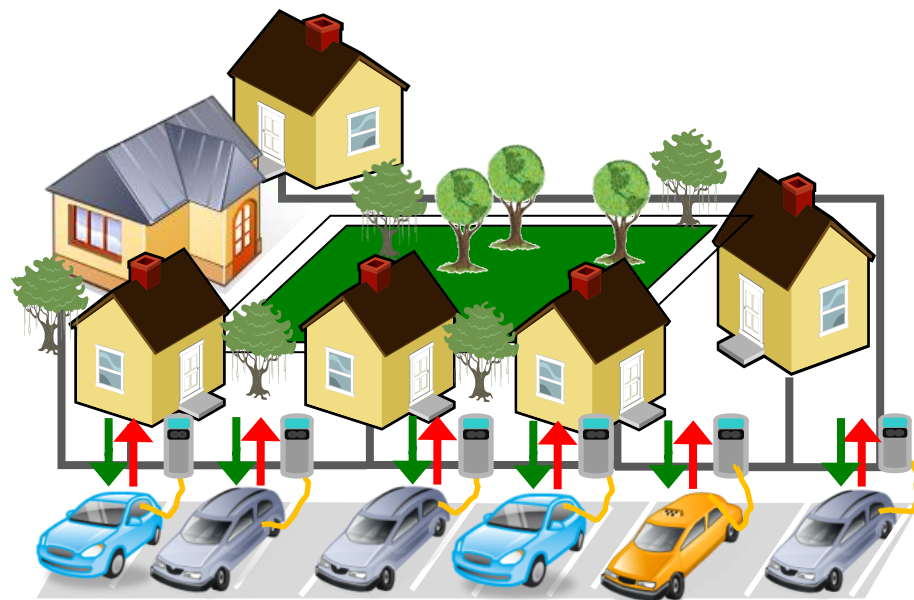
Charging points in the pilot phase

of charging points



- The pilot phase was launched this year and will test technical, services and business solutions

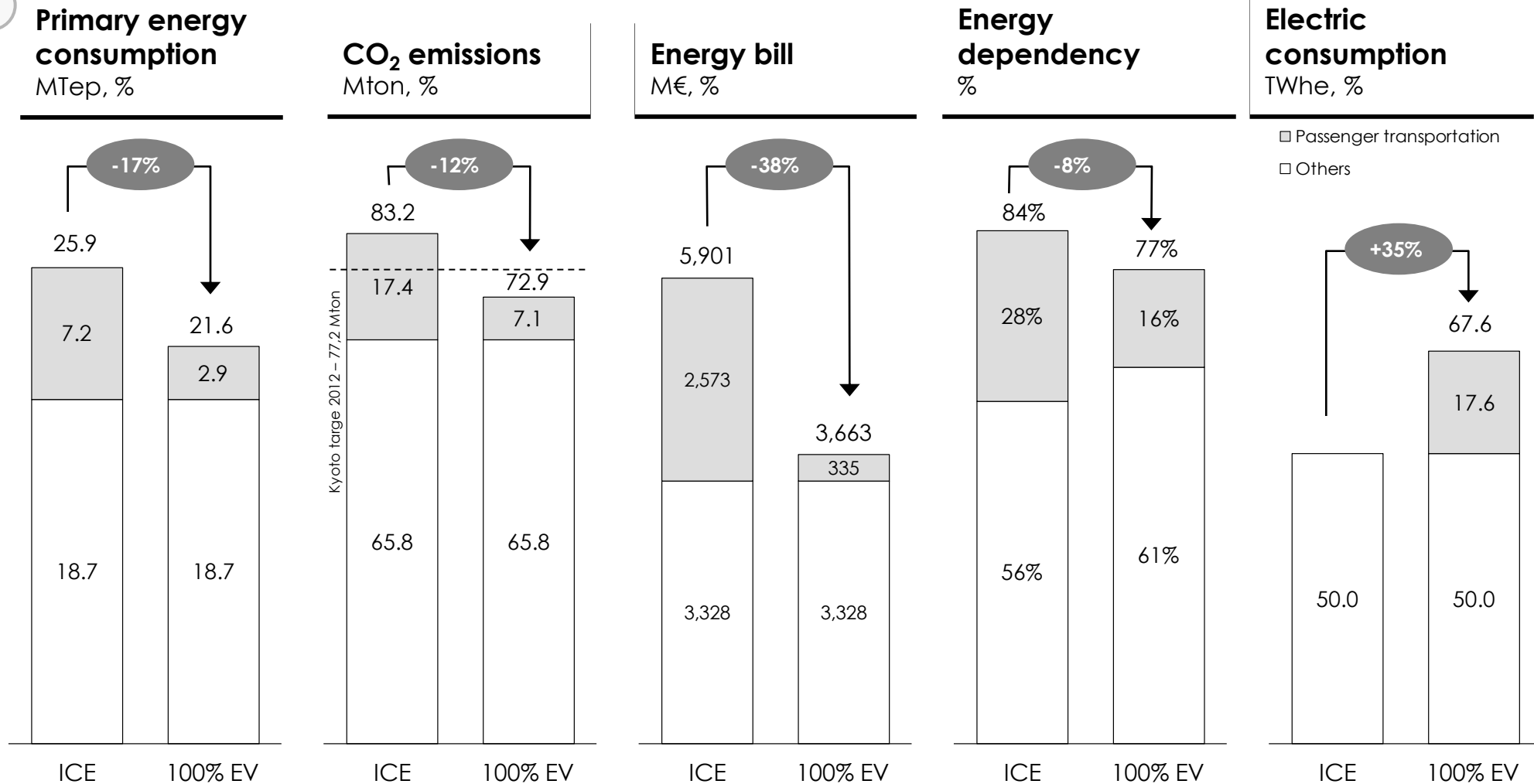
Schematic representation of the vehicle-to-grid (V2G) concept



- In a mature phase, V2G will allow not only buying electricity to charge the vehicle but also selling the stored energy to the grid (intelligent charging and distributed storage)

If all vehicles became electric, the impact would be very significant for the national energy balance

F



Note: Assuming generation mix 35% CCGT, 25% coal and 40% renewables; Base year used: 2006
 Source: DGEG, DPE analysis

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Conclusions

- **Portugal has a high dependency on primary energy fossil fuels imports**
 - 82% vs. 56% of EU15, in 2007
- **The power sector has a better performance in terms of security of supply than the energy sector in general**
 - Higher fuel diversity
 - Less dependency on imports
 - Adequate reserve margin
- **Portuguese energy strategy is focused on improving security of supply, promoting renewables, efficient conventional thermoelectric power, and energy efficiency**
 - Set targets of 45% and 60% for renewables in the electricity mix in 2010 and 2020, respectively, with a clear focus on hydro and wind
 - Awarded licenses for new natural gas generation capacity of 3,200 MW
 - Approved legislation and launched programs to improve energy efficiency and promote the adoption of electric vehicles