Promotion of RES-E in Portugal

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Direcção Geral
de Geologia e Energia

MINISTÉRIO DA ECONOMIA
E DA INOVAÇÃO

General Overview

In Portugal electricity represents about 20% of final energy consumption.

The share of renewables in total electricity production is about 30 to 40%, which is based on hydro power plants.

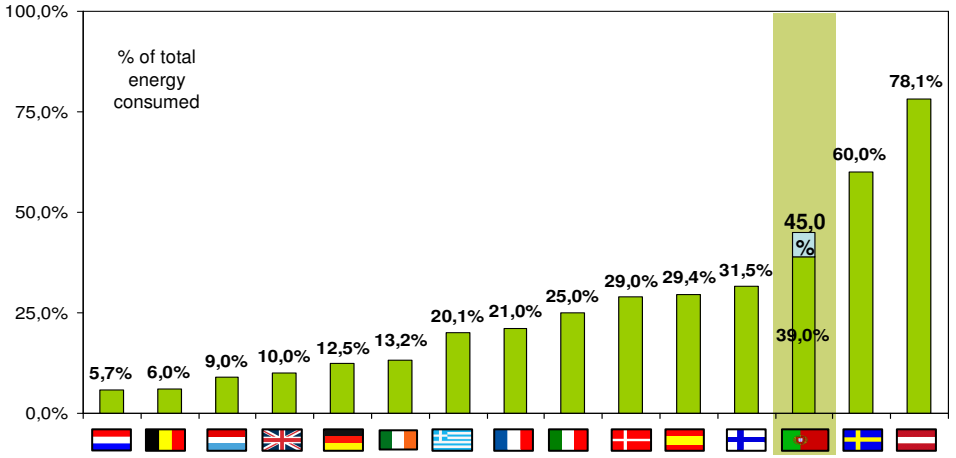
Wind energy is the renewable source with higher rate of evolution in the last years. The supply of electricity from this source, in August 2008, reached 4 916 GWh.

Emerging technologies, like wave energy and solar energy for electricity production, and conventional technologies, like biomass and biogas power plants, have new and ambitious targets for 2010.

Ambitious targets for renewable

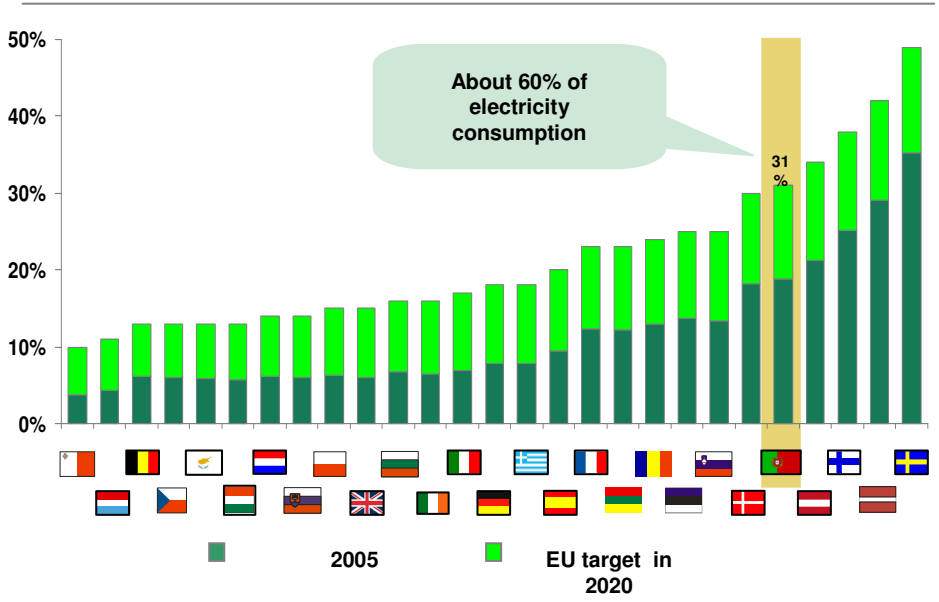
- Increase the target set for 2010 for power generation based on renewable energies from 39% to 45% of total electricity consumption
- 31% of primary energy in 2020

Renewable targets for 2010 (Directiva 2001/77/CE)



Fonte: Directiva 2001/77/CE; Ministério da Economia e Invovação; DGGE

% of renewable energy in total energy demand in 2020



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New objectives for various renewable energy sources

Wind Power

- **To increase installed capacity by 1950 MW by the year 2012, to total 5 100 MW (600 MW of which comprising equipment upgrades) and investment in a technological cluster associated with wind power**

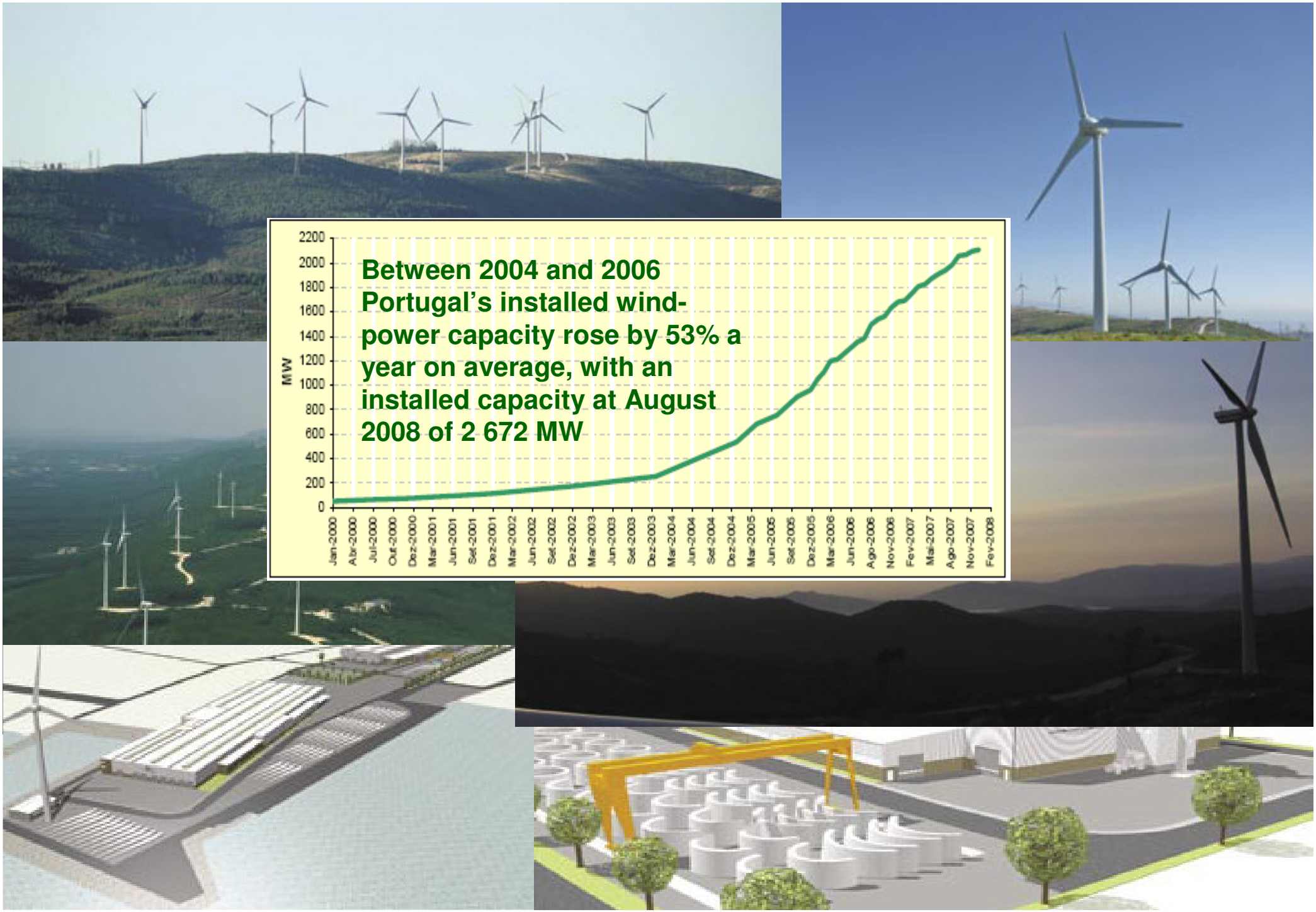
Hidropower

- **Reinforcement of the rated power of current hydroelectric infrastructures, to achieve 5 575 MW of installed capacity in 2010 (575 MW more than previously forecast) and achieving a 70% rate of exploitation of national hydroelectric generating capacity potential in the medium term**

Other Renewable

- **Biomass**: 250 MW in electricity generating capacity by 2010
- **Solar**: Construction of the biggest worldwide photovoltaic power station (Moura) – and association with microgeneration and solar hot water policies and goals
- **Wave Power**: Creation of a pilot zone with a total potential operating capacity of up to 250 MW for the technological development of new prototypes at their industrial and pre-commercial stages
- **Biogas**: A target of 100 MW of installed rated power in units for anaerobic waste processing

	Investiment (2007 - 2015)	New direct jobs	Reduction of CO_2
Renewable ES	**€11,5bn**	**~20,000**	**~11 Mt/ano**


Between 2004 and 2006 Portugal's installed wind-power capacity rose by 53% a year on average, with an installed capacity at August 2008 of 2 672 MW
MW
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Jan-2000
Abr-2000
Jul-2000
Out-2000
Dez-2000
Mar-2001
Jun-2001
Set-2001
Dez-2001
Mar-2002
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Dez-2005
Mar-2006
Jun-2006
Ago-2006
Nov-2006
Fev-2007
Mai-2007
Ago-2007
Nov-2007
Fev-2008

Legal Framework

Decree-Law 189/88	Since 1988, it's possible for independent producers based on renewables to produce and sell electricity to the public grid, limited to 10 MVA
Decree-Law 313/95	Establishes the legal framework of Independent Electricity System, concerning the electricity production activities of hydroelectric power plants up to 10 MVA and the other renewable energies sources without capacity limits
Decree-Law 168/99	Reviewing the regime applicable to electricity production activities
Decree-Law 312/2001	Define the new management regime for electricity delivery on public service electricity grids by renewables power plants
Decree-Law 339-C/2001	Changes Decree-Law 168/99, namely, the regime applicable to the payment for electricity production, under the Independent Electricity System's
Decree-Law 33-A/2005	Review the former tariff conditions
Decree-Law 225/2007	Introduce new tariffs for emerging technologies, such as wave energy and solar thermal for electricity production, between others technologies

Formula

The RES-E producers receive a monthly payment that is calculated by a **formula** set in the legislation:

$$VDR_m = \{KMHO_m \times [PF(VDR)_m + PV(VDR)_m] + PA(VDR)_m \times Z\} \times (IPC_{m-1}/IPC_{ref}) \times [1/(1-LEV)]$$

The elements of the formula represent different factors that influence the costs avoided due to electricity generation from RES-E.

- **$KMHO_m$:** Different tariff levels for electricity generated during day and night time;
- **$PF(VDR)_m$:** A fixed contribution on the plant capacity that reflects the avoided investment for conventional power plants that would have to be built;
- **$PV(VDR)_m$:** A variable contribution per kWh of electricity generated that corresponds to the power generation costs of the conventional power plants;

Formula

➢ **$PA(VDR)_m$:** An environmental parcel corresponding to the costs for CO_2 emissions prevented due to RES-E generation, multiplied by a technology-specific coefficient;

➢ **IPC_{m-1}/IPC_{ref}:** Adjustment to inflation;

➢ **1/(1-LEV):** A factor that represents the avoided electrical losses in the grid due to the RES-E plant

The environmental parcel is multiplied by the coefficient **Z**, which varies according to the RES-E technology. Due to the introduction of this coefficient in 2001 (Decree-Law 339-C/2001) the support system for RES-E changed from being only based on the avoided costs due to RES-E generation to a concept that also takes into account different electricity generation costs according to the RES-E technology.

Average IndicativeTariff (Decree-Law 225/2007)

RES-E technology	Average Indicative Tariff (€/MWh)
Wind	75
Hydro up to 10 MW	77
Photovoltaic up to 5 kW	450
Photovoltaic above 5 kW	317
Solar thermoelectric up to 10 MW	273
Micro generation PV up to 5 kW	470
Micro generation PV above 5 kW	355
Forest biomass	109
Animal biomass	104

Average IndicativeTariff (Decree-Law 225/2007)

RES-E technology		Average Indicative Tariff (€/MWh)
Biogas (anaerobic)		117
Biogas (landfill gas)		104
Solid Urban Waste		54
Waste Combustion		76
Wave (demonstration up to 4 MW)		260
Wave (Pre-commercial up to 20 MW)		191
Wave (commercial)	First 100 MW	131
	Subsequent 150 MW	101
	Thereafter	76

Duration of the support

The operators of wind, small hydro and PV power plants receive fixed FITs for the first 15 or 20 years from the beginning of the production, depending the RES-E technology, **or** for a certain amount of electricity generation per MW of the plant capacity.

RES-E Technology	Years	Amount of supported electricity (GWh/MW capacity)
Wind	**15**	**33**
Small hydro	**20**	**52**
Photovoltaic	**15**	**21**

Conclusion about the experience FIT in Portugal

It has been shown in the past that the level and the guaranteed duration of support as well as investment security have been crucial to attract investors and to increase the exploitation of RES-E.

Since the power generation costs of different RES-E technologies vary, a successful FIT design should provide technology-specific tariff levels.

The remuneration should cover the electricity generation costs and provide a reasonable profit margin.

The costs for RES-E support are included in the electricity price and therefore are transferred to the electricity consumers.

High FITs lead to benefits for the investors, but also to a higher burden on society.

It's a challenge for the energy policy to determine an appropriate level of FITs which leads to new installations of RES-E technologies and at the same time keeps the burden on the electricity consumers at a moderate level.

Thank you for your attention

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