

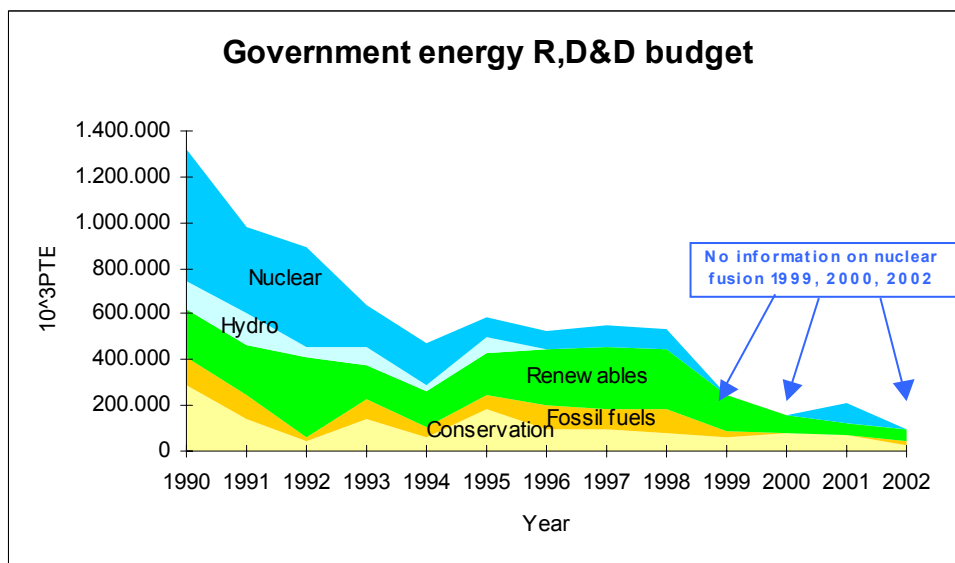


Recent Developments in Energy Technology in Portugal

Contribution to the Roundtable: 31st meeting of the IEA Committee CERT
Paris, 9 – 10th April 2002

On 15th January 2001 the Minister of Economy, with the objective to promote energy efficiency and the use of endogenous energy resources, published a White Paper defining the guidelines for a new policy on energy. A new programme, called E4, was launched in September 2001 to support this policy. The level of financing for the implementation of new projects is in the order of 10 609 m€ (5330 m€ of which supported by European and Governmental funds), which is covered by POE, the Global Incentive Programme of the Ministry of Economy, aiming at the modernization of the Portuguese industry. The duration of this programme is set for a time period from January 2000 to December 2006, and the contribution of the European Union alone is 3290 m€.

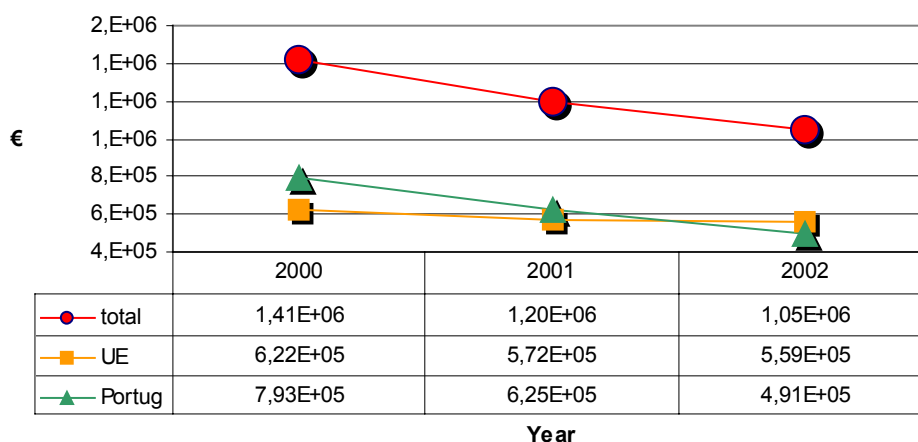
Research and development is carried out at universities, R&D centres and National laboratories, and some of the projects are in collaboration with industrial companies. Projects have been financed by the Portuguese Government and the European Union, and also by the private sector in the case of those with industrial cooperation. Since 1990, governmental funds have been reduced for Energy R&D, as it can be seen in the following figure presenting R&D budgets of the Portuguese Government, without personnel expenditure. The following figure presents the total expenditure considering the EU contribution for the last 3 years. It should be noted that nuclear R&D carried out in 1999/2000 was not related to energy, and in 2000, nuclear fusion, the main area of research, was undertaken by Nuclear Fusion Centre in the Technical University of Lisbon. Its budget in 2001 corresponds to about 50 % of the total expenditure on energy.



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No nuclear budget in R&D



Currently, about 84 % of the total spending on non-nuclear Energy R&D in Portugal belongs to INETI, the National Laboratory within the Ministry of Economy. Recent developments focus on co-combustion of coal and different types of wastes, with particular emphasis on fluidised bed technology applied to both combustion and gasification. The combustion of wastes alone in fluidised beds is an area of growing interest, particularly its integration in cogeneration systems. In addition, in the area of waste conversion for energy production, studies are being carried out in the domain of pyrolysis with the development of suspended flow reactor technology for plastic wastes. A new project has been launched in 2000 on hydrogen production using steam gasification of biomass for energy generation integrating fuel cell technology, and in 2002 this concept has been proposed for demonstration.

With regard to renewable energy, a forum was organized in 2001 to identify the potential for energy production as well as the needs for national developments to increase the contribution of energy production from renewable sources. The conclusions refer to a contribution for energy projected around 13% for the year 2010, which is above the target set up by the European Union. The following Table shows the potential energy of different resources, without the contribution of large size hydropower plants, together with the measures identified for their implementation. It is noted that in 2000, the total contribution of renewables (mainly hydro, wind and geothermal) to National Total Primary Energy in Portugal was of the order of 5%, of which 28% was responsible for electricity production.

Source	Energy production TWh/year	Measures
Solar thermal	2.5	Fiscal incentives; Hot water sales promotion; certification initiatives and dissemination activities
Solar photovoltaic	0.05	Fiscal incentives; Reduced tariffs; Training actions and Research still needed
Biogas	0.88	Fiscal incentives; Dissemination and promotion of Technological Projects
Biomass	1.4	Reduced tariffs; Promotion of initiatives and incentives to clean forests; Better integration into the National electricity grid
Geothermal	0.44	Dissemination and promotion of technological projects launched by schemes with fiscal incentives
Oceans (Waves)	0.1	Creation of an Information Centre on Wave Energy
Mini-hydro	1.6	Less bureaucracy in licensing units
Wind	5.5	Proper Legislation, better financing schemes and reduced tariffs
Total	13	

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There has been considerable effort to enhance international cooperation both for R&D projects and for information exchange. Protocols have recently been signed between Portugal and Portuguese speaking countries to reinforce the cooperation in the areas of science and technology.

Portugal presently participates in 7 Implementing Agreements, i.e. Fluidised Bed Conversion, Process Integration, Solar Heating and Cooling Systems, Photovoltaic Power Systems, Ocean Energy Systems, Buildings and Community Systems. Portugal is a member of ICGTI centre and the Government has decided to join ETDE. This agreement is considered important since it will provide an opportunity for Portuguese organisations to network with International centres and universities with activities in the areas of energy. There has also been demonstrated some interest to join other agreements, namely Bio-energy, Hydrogen, Wind Turbine Systems, GHG and ETSAP. They are being assessed for cost considerations to verify if the participation would deliver the desired benefits in a cost-effective manner.

INETI has adopted a new strategy, which aims at initiating global programmes with the objective of encouraging the inter-disciplinary collaboration. In this way, it will be possible to take advantage of the multi-disciplinary nature of activities and competence of INETI to be more productive. For the period of 2002-2005, the programmes related to energy that are launched are the following:

- Promotion of new applications of products and processes in a sustainable manner with minimum impact on the environment
- Energy efficiency for both production and end-use
- Sustainable development to ensure environmental safety and security
- Re-utilisation of used materials in an energy efficient manner
- Reinforcement of the cooperation with the recently created Energy Agency.

Information on the Portuguese Energy Agency (ADENE) is also presented, as well as more detailed information on the ongoing R&D projects included in the total R&D budget presented above.



AGÊNCIA PARA A ENERGIA

Portuguese Energy Agency

In September 2001 the Portuguese Government, launch a Programme E-4 (Energy Efficiency and Endogenous Energies) which correspond to a set of multiple and diversified measures aimed at promoting a consistent and integrated approach to energy supply and demand. Among the measures, one of the goals was the re-definition and strengthening the role played by the National Agency for Energy. In December 2001, a new Law defined the “new” Agency its mission and its role.

The Agency has as stakeholder the Ministry of Economy (National Energy Directorate (DGE), National Industry Directorate (DGI), and National Institute of Engineering and Industrial Technology (INETI)) with a global participation of 70%, and major Energy Companies-30%.

The main goal of the Agency is to contribute for the improvement of the energy efficiency in all sectors, to increase the use of the renewable energies and also to contribute for the national effort of reduction of the greenhouse gas emissions. The Agency together with the administration, the companies, and the local and regional energy agencies will carry out projects and actions in order to achieve the main goals defined by the Portuguese Government for the Energy Sector.

The main actions which will be carried out in the near future correspond to a set of National Programs such as *Solar Hot Water for Portugal*, with a goal to increase the solar market in order to get one million solar collectors installed in 2010, and the *Building Efficient Programme* which will increase the overall quality of the new buildings and systems reducing the energy consumption in the new buildings. A *Demand Side Programme* is under preparation with the main Portuguese Utility Company to reduce the increase of energy consumption in some sectors.

One of the major objectives of the Agency is to get data, information related with energy issues and to provide this information to the public in general. An *Energy Observer Site* is under construction, which will collect and treat all the information related with the renewable energies and energy efficiency in buildings. The Agency conducts an intensive cooperation, at international level with institutions and Energy Agencies in joint projects and thematic grids.

Budget IDD*10³ esc*

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Conservation	289.115	143.026	41.172	142.657	63.057	182.188	94.015	96.191	77.022	20.163	64.600	56.700	0	
Biomass	86.845	65.770	81.115	13.270	78.133	30.602	75.027	71.153	72.035	11.121	15.472	24.440	21.856	
Solar	71.705	102.878	142.596	88.569	74.788	120.601	164.690	191.650	176.321	8.258	16.327	16.334	22.072	
Wind	13.730	11.792	35.954	29.975	1.010	858	0	0	0	448	1.498	2.173	10.194	
Waves	21.970	18.449	35.757	20.483	0	19.219	0	0	0	94.785	37.014	3.149	2.651	
Geothermal	12.900	21.320	49.033	0	2.500	7.633	7.350	7.000	10.700	39.218	6.350	5.300	2.000	
Hydro	124.640	136.640	49.254	75.950	26.250	75.668	0	0	0	0	0	0	0	
Fossil fuels	123.390	99.935	22.000	82.842	41.291	65.701	104.797	88.853	107.142	27.449	1.900	500	13.129	
Nuclear	576.972	382.997	435.725	183.139	187.162	85.972	78.832	93.800	86.400	0	0	340.000	0	
Total Power & storage tech.							4.500	3.000	3.000	0	12.206	7.691	1.691	
Cross-cutting tech							1500	2442	2442	41692	3.637	9.071	24.796	
total 10 ³ esc	1.321.267	982.807	892.606	636.885	474.191	588.442	530.711	554.089	535.062	243.134	159.003	465.357	98.390	
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Conservation	289.115	143.026	41.172	142.657	63.057	182.188	94.015	96.191	77.022	61.855	80.443	73.462	26.487	
Fossil fuels	123.390	99.935	22.000	82.842	41.291	65.701	104.797	88.853	107.142	27.449	1.900	500	13.129	
Renewables	207.150	220.209	344.455	152.297	156.431	178.913	247.067	269.803	259.056	153.830	76.661	51.395	58.774	
Hydro	124.640	136.640	49.254	75.950	26.250	75.668	0	0	0	0	0	0	0	
Nuclear	576.972	382.997	435.725	183.139	187.162	85.972	78.832	93.800	86.400	0	0	340.000	0	
Total 10 ³ esc	1.321.267	982.807	892.606	636.885	474.191	588.442	524.711	548.647	529.620	243.134	159.003	465.357	98.390	
No nuclear	€	3.712.527	2.991.839	2.278.912	2.263.275	1.431.694	2.506.309	2.224.035	2.268.767	2.210.772	1.212.747	793.106	625.276	490.767
Total	€	6.590.452	4.902.22	4.452.299	3.176.768	2.365.254	2.935.136	2.617.247	2.736.639	2.641.733	1.212.747	793.106	2.321.189	490.767