

PORTUGAL

The energy sector

Energy consumption in Portugal is growing and is expected to continue growing with GDP. Portugal has a low energy production and is increasingly dependent on imported energy. Portuguese energy policy has aimed at liberalising energy markets, ensuring security of energy supply, improving energy efficiency and mitigating environmental problems. Consistent with these objectives, Portugal has increased its effort to diversify energy sources, in particular through the introduction of natural gas, and to improve energy efficiency with the support of the European Union's "Community Support Framework".

Energy balances in Portugal (Source: Energy Policies of IEA Countries, 2001)

	1999	%		1999	%
Population (millions)	9.98		Total final consumption	17.8	
Energy consumption/capita	1.78		Coal	0.36	2.02
Total energy production (Mtoe)	1.94		Oil	12.71	71.36
Coal	-	-	Gas	0.56	3.14
Oil	-	-	Biomass & Wastes	0.97	5.45
Gas	-	-	Geothermal	0.00	0.00
Biomass & Wastes	1.22	62.89	Solar/Wind/Other	0.02	0.11
Nuclear	-	-	Electricity	3.11	17.46
Hydro	0.63	32.47	Heat	0.09	0.51
Geothermal	0.07	3.61	Total industry consumption	7.62	
Solar/Wind/Other	0.03	1.55	Coal	0.36	4.72
Net energy imports (Mtoe)	21.95		Oil	4.91	64.44
Coal	3.74	17.04	Gas	0.44	5.77
Oil	16.33	74.40	Biomass & Wastes	0.54	7.09
Gas	1.95	8.88	Geothermal	-	-
Electricity	-0.07	-0.32	Solar/Wind/Other	-	-
Total supply - TPES (Mtoe)	23.63		Electricity	1.30	17.06
Coal	3.79	16.04	Heat	0.08	8.25
Oil	16.03	67.84	Transport consumption	6.19	
Gas	1.94	8.21	Total other sectors consumption	4.00	
Biomass & Wastes	1.22	5.16	Coal	-	-
Nuclear	-	-	Oil	1.65	41.25
Hydro	0.63	2.67	Gas	0.12	3.00
Geothermal	0.07	0.30	Biomass & Wastes	0.43	10.75
Solar/Wind/Other	0.03	0.13	Geothermal	0.00	0.00
Electricity Trade	-0.07	-0.30	Solar/Wind/Other	0.02	0.50
Electricity generation	3.69		Electricity	1.78	44.50
Electricity generation (TWh)	42.93		Heat	-	-

In 1998, energy production in Portugal was less than 11% of total supply. All domestic energy production is from renewable sources. Hydro is the most important renewable source, but hydro availability varies widely. Between 1973 and 1998, energy supply increased at an annual rate of 4.5%, thanks to the country's strong growth and rapid development. In spite of this growth, in 1998 Portugal had the lowest energy supply per capita of the EU. In 1998, it

amounted to just above 2 toe (EU average of around 3.8 toe). Oil has been the dominant fuel due to extensive use of oil in power generation and the increase in end-use energy consumption owing to the economic development of the country. Coal supply increased rapidly between the mid-1980s and the mid-1990s, after the commissioning of the 1,200 MW Sines and the 615 MW Pego power plants, to diversify from heavy fuel oil. Gas supply and imports started at the end of 1997 and amounted to 0.7 Mtoe in 1998.

Portugal's dependence on imported fuels is large and increasing. Total net imports of energy amounted to 88.5% of total energy supply. Oil is still the major imported fuel, followed by coal and natural gas.

Between 1973 and 1998, TFC increased at an annual rate of 4.2%. Industry is the largest final consumer of energy in Portugal. On the other hand, transport is the fastest growing sector, increasing regularly at an average annual rate of more than 6%. In 1998, oil consumption in the transport sector reached 46.3% of total final consumption of oil.

Electricity consumption increased at an annual rate of nearly 6% between 1973 and 1998 (European Union average is 2.5% per year). However, electricity consumption per capita was the lowest in the European Union and the third lowest of IEA countries. Although increasing, electricity consumption per GDP (in purchasing power parity) was also at a lower level than the IEA Europe average. The increase in the commercial sector (more than 8% per year between 1973 and 1998) has been the most rapid. Around two-thirds of electricity consumers are concentrated in the Porto and Lisbon areas.

Total installed capacity was 10 GW in 1999. Hydro capacity was 4.4 GW, followed by oil (2.6 GW), coal (1.8 GW), natural gas (0.9 GW) and renewable sources (0.3 GW). The increase in generation has been in pace with consumption.

Policy for renewables and CHP

Under the 1994 Energy Programme, state and EU funds can support between 20 and 25% of capital investment, up to PTE 300 million, through zero-interest loans. In addition:

- **DECREE-LAW N.189/88:** Must-take obligations by REN and favourable buy-back tariffs set according to the price paid by end-use customers.
- **DECREE-LAW N.186/95:** Minimum efficiency values and the minimum heat utilisation necessary for co-generators to qualify. The buy-back tariff for co-generators is as follows:
 1. The buy-back tariff for co-generators below 10 MW is calculated according to the price paid by end-use customers in the medium and high voltage tariff range. A minimum of 55% efficiency is required to qualify.
 2. For co-generators above 10 MW, the buy-back tariff is based on avoided costs calculated as the cost of building a new CCGT plant. Payments increase when the heat rate value and the availability of the plant increase.
 3. Co-generators pay for connection to the grid.
- **DECREE-LAW N.538/99:** Allows sales to affiliate companies as well as to companies buying heat. This regulation will be valid for ten years.
- **DECREE-LAW N.168/99:** Feed-in tariff for electricity produced from renewable energy sources.
- **MAPE-Support measure for Energy Potential Development:** Provides support to projects of a total minimum investment 25000 Euros, aimed at fostering rational use of energy, energy production based on renewable energy sources and the conversion to natural gas, including the renewal of road transport fleets.

CHP and biomass-CHP

Energy from renewable sources is promoted through grants and zero-interest loans, and is also sold to REN under a favourable buy-back tariff. Electricity production from biomass and waste increased from 689 GWh in 1990 to 1,023 GWh in 1998.

Cogeneration capacity increased from about 600 MWe in 1990 to about 900 MWe in 1998. Generation amounted to about 4.5 TWh in 1998, including 3.2 TWh in autoconsumption.

- **Mortagua Power Plant**

The plant started on August 1999. Forest residues and bark are burnt in a biomass boiler of 30MWth using natural gas as a start up and regulation fuel. Having a gross electrical efficiency of 26.5% and working 7800 h/y, the plant can produce 60 GWh_e/y.

- **Cacia Pulp mill**

Eucalyptus and pine bark and sawdust as well as woodchips from forest management operations are used in one of the three boilers in the mill (the other two are black liquor recovery boilers). A steam turbine, along with two turbo-generators (28.6 and 5 MW), produces the electricity.