



Traditional and alternative forms of energy in Portugal

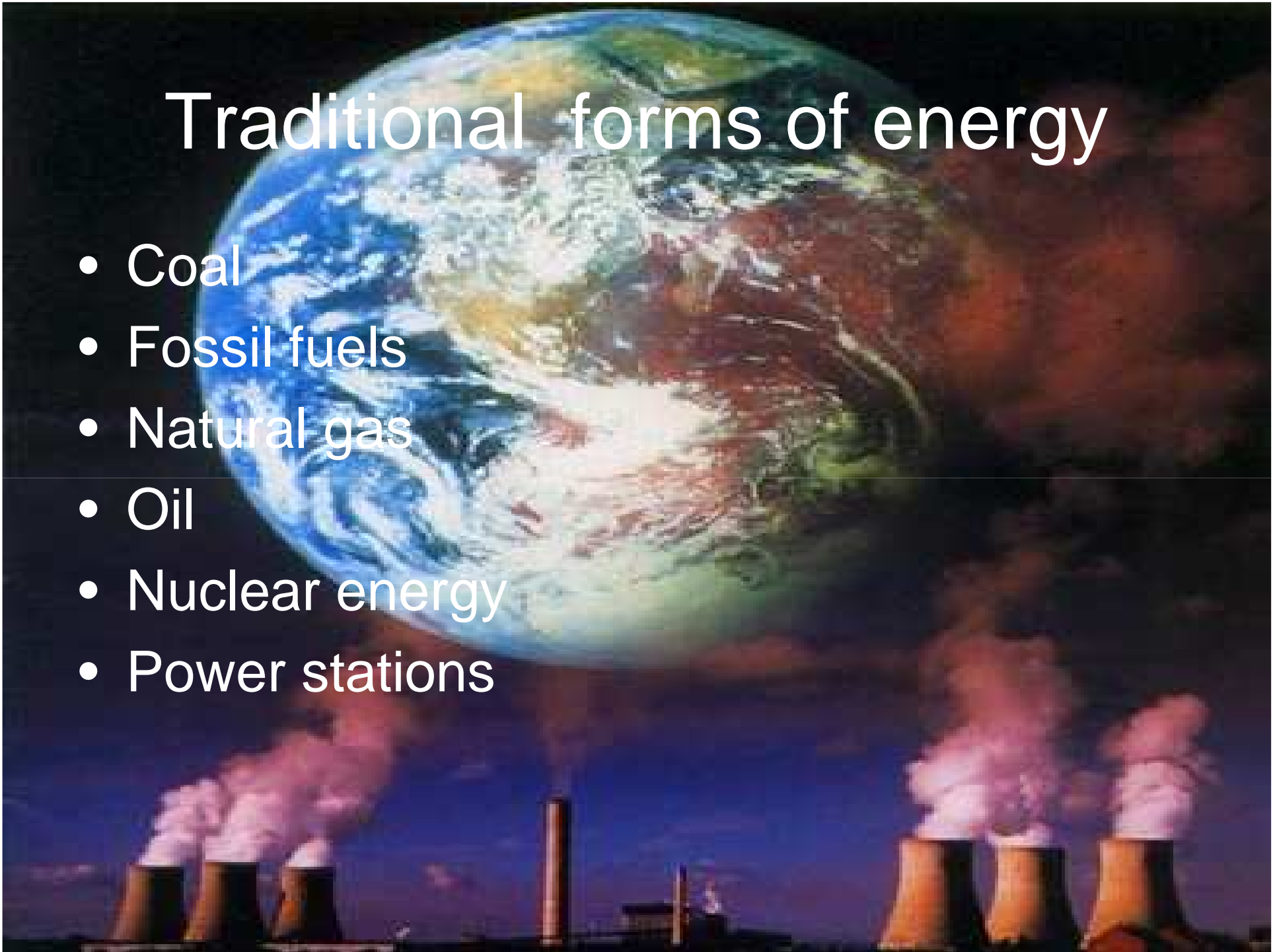


Traditional forms of energy

- We are going to talk about traditional and alternative energies used in Portugal like coal, natural gas, oil, hydroelectric, solar, wave, wind and geothermal energies.

Traditional forms of energy

- Coal
- Fossil fuels
- Natural gas
- Oil
- Nuclear energy
- Power stations

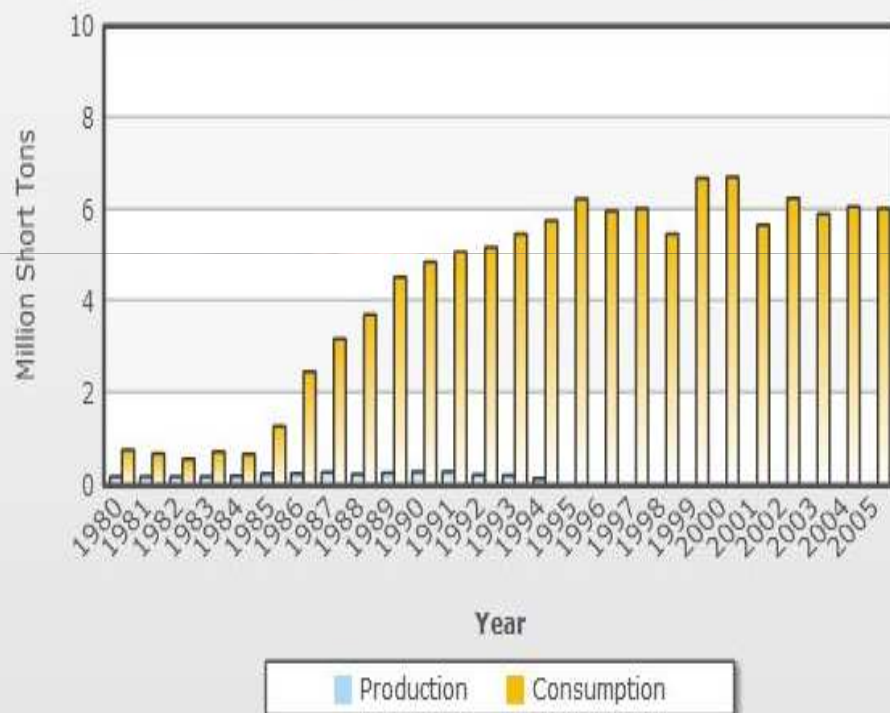


Coal

- Starting with coal, we know that its use decreased a lot since Industrial Revolution but it continues to be used in some activities. By observing the following graph, we see that Portugal produced coal until 1995 but the production till there was very inferior compared with the use, what means that Portugal imported a lot of coal.

Production and consumption of coal in Portugal

Portugal Coal Production and Consumption by Year

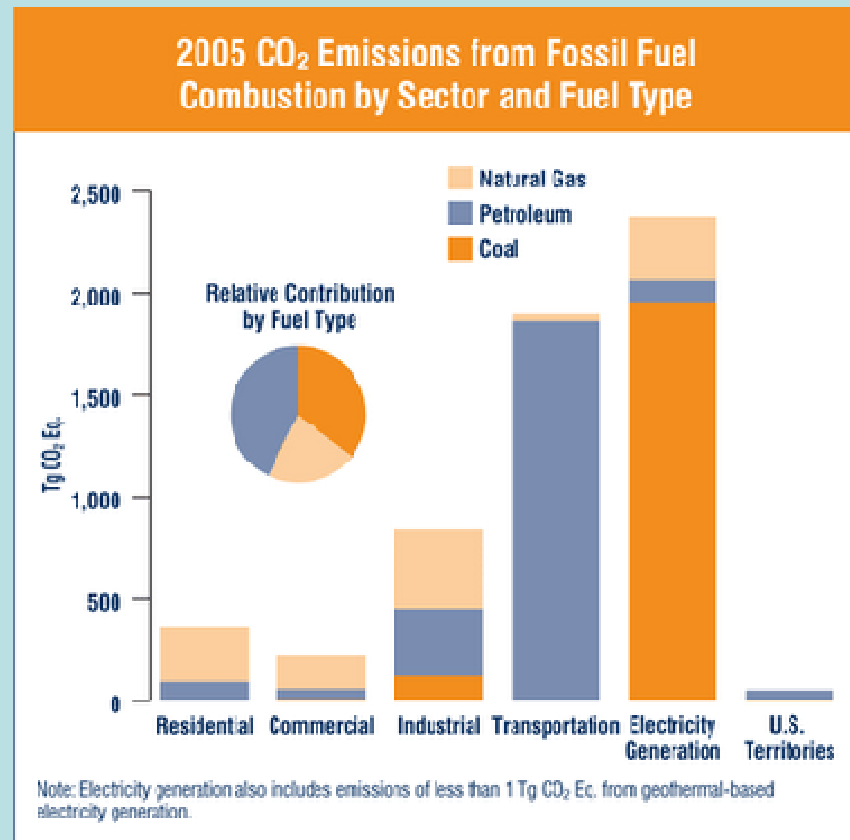
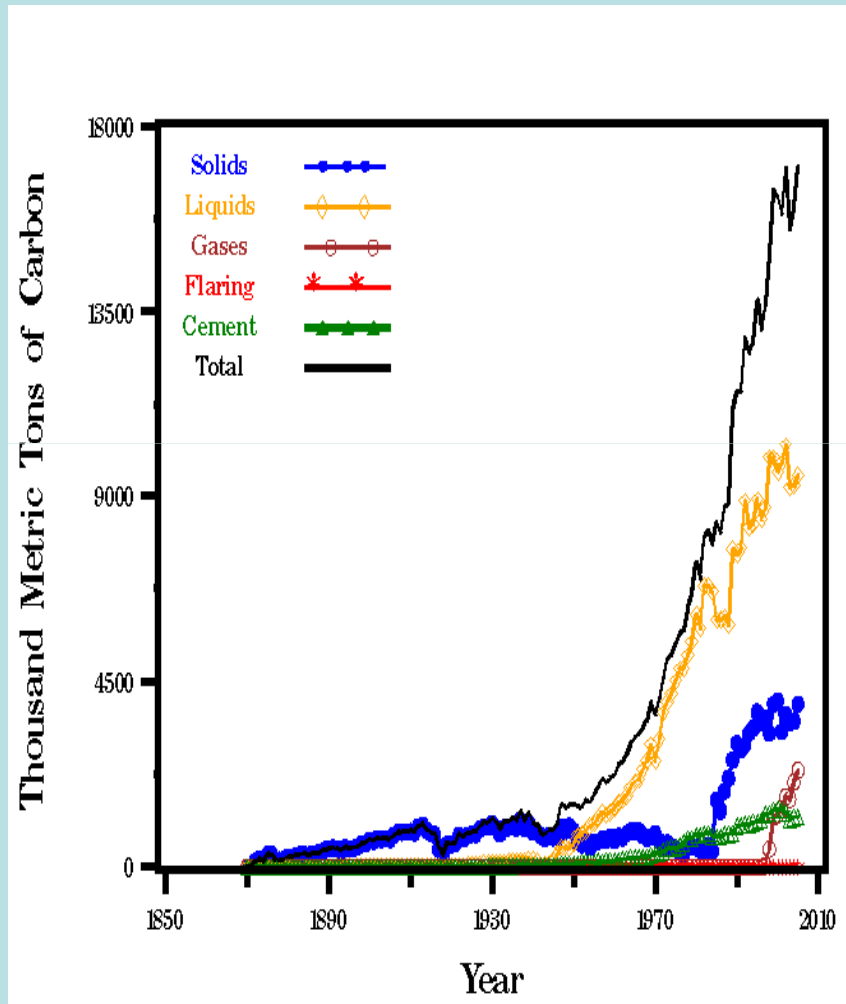


Year	production	consumption
1992	0.24	5.196
1993	0.22	5.491
1994	0.16	5.776
1995	0	6.253
1996	0	5.994
1997	0	6.046
1998	0	5.495
1999	0	6.705
2000	0	6.731
2001	0	5.686
2002	0	6.217
2003	0	5.992
2004	0	6.086
2005	0	6.042

Fossil fuels

- In what concerns to fossil fuels we know that their use has increased a lot since Industrial Revolution and it hasn't stopped till now.

Fossil fuels

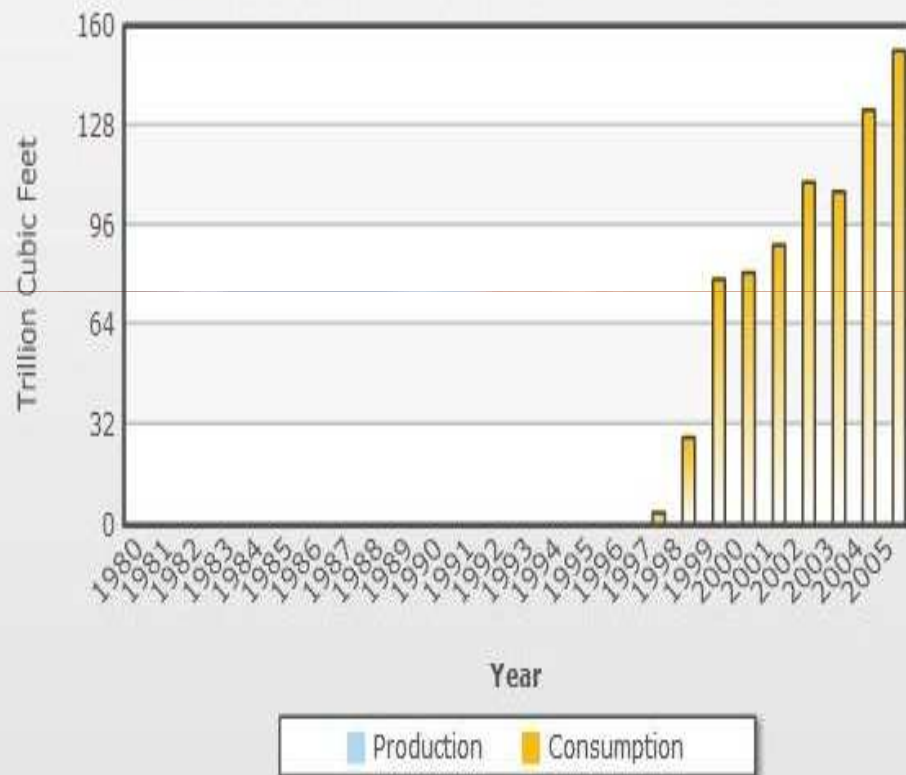


Natural gas

- Talking about natural gas, we don't produce it in Portugal, but we consume since 1997 (and we can see this information in the following graph).

Natural gas

Portugal Dry Natural Gas Production and Consumption by Year

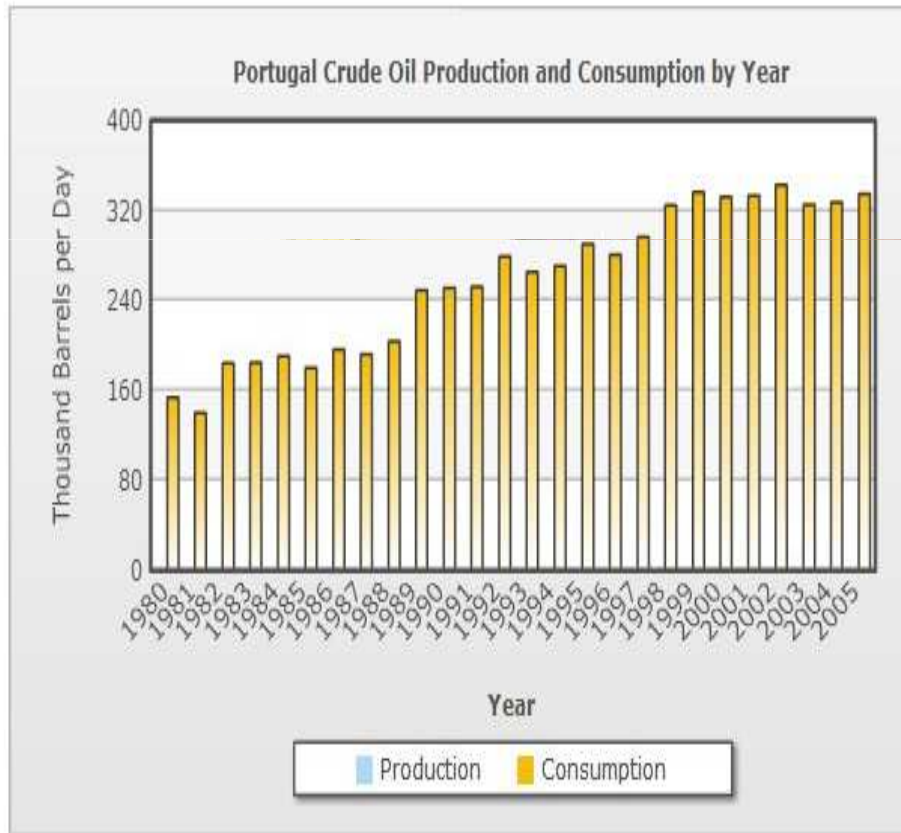


Year	Production	consumption
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	4
1998	0	28
1999	0	79
2000	0	81
2001	0	90
2002	0	110
2003	0	107
2004	0	133
2005	0	152

Oil

- Referring to oil, everybody knows that its use has increased a lot since Industrial Revolution and Portugal doesn't produce oil but uses it a lot.

Oil



Year	Production	Consumption
1992	0	278.89
1993	0	265.55
1994	0	270.91
1995	0	290.16
1996	0	280.45
1997	0	297.22
1998	0	325.15
1999	0	336.78
2000	0	332.66
2001	0	333.81
2002	0	343.18
2003	0	325.96
2004	0	327.91
2005	0	335.45

Nuclear energy

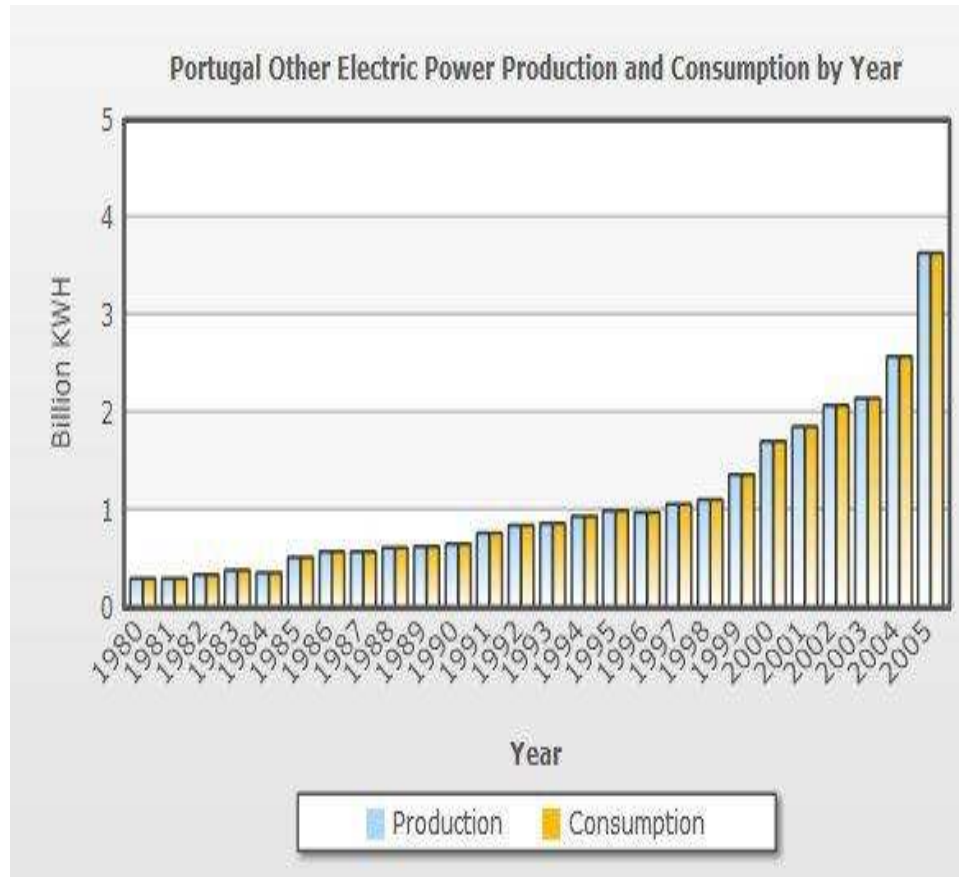
- Europe (as we can see in the picture) has already several nuclear power plants. In Portugal, there are developing studies to start constructing a nuclear power plant in the next 3 years.



Power stations

- In what concerns to power station/ other electric power, it's the only traditional energy that Portugal only uses what produces and, looking at the graph, we know that Portugal is producing more and more.

Power station - Other electric power

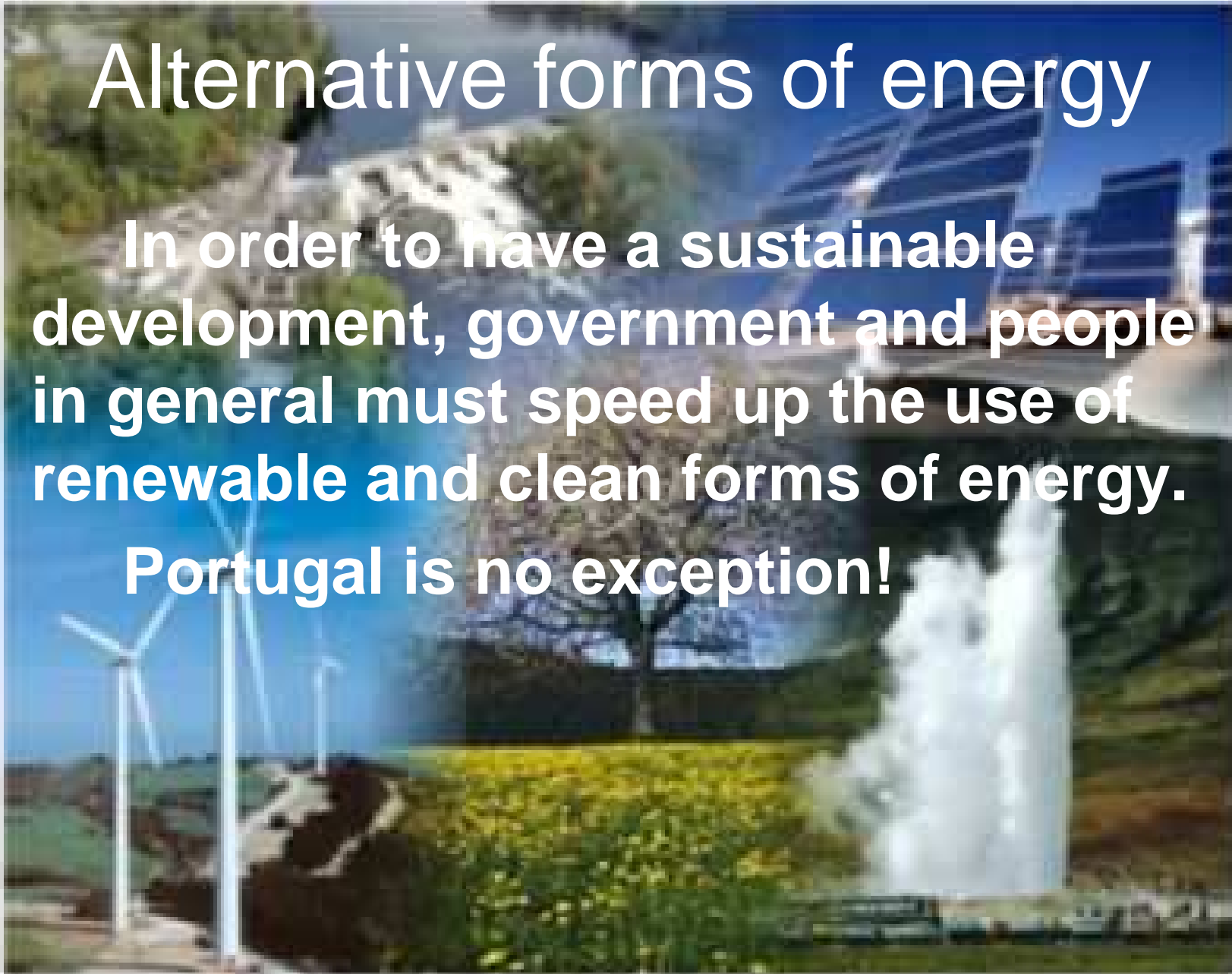


Year	Production	Consumption
1992	0.85	0.85
1993	0.87	0.87
1994	0.94	0.94
1995	1	1
1996	0.98	0.97
1997	1.07	1.07
1998	1.11	1.11
1999	1.37	1.37
2000	1.71	1.71
2001	1.86	1.86
2002	2.08	2.08
2003	2.15	2.15
2004	2.58	2.58
2005	3.64	3.64

Alternative forms of energy

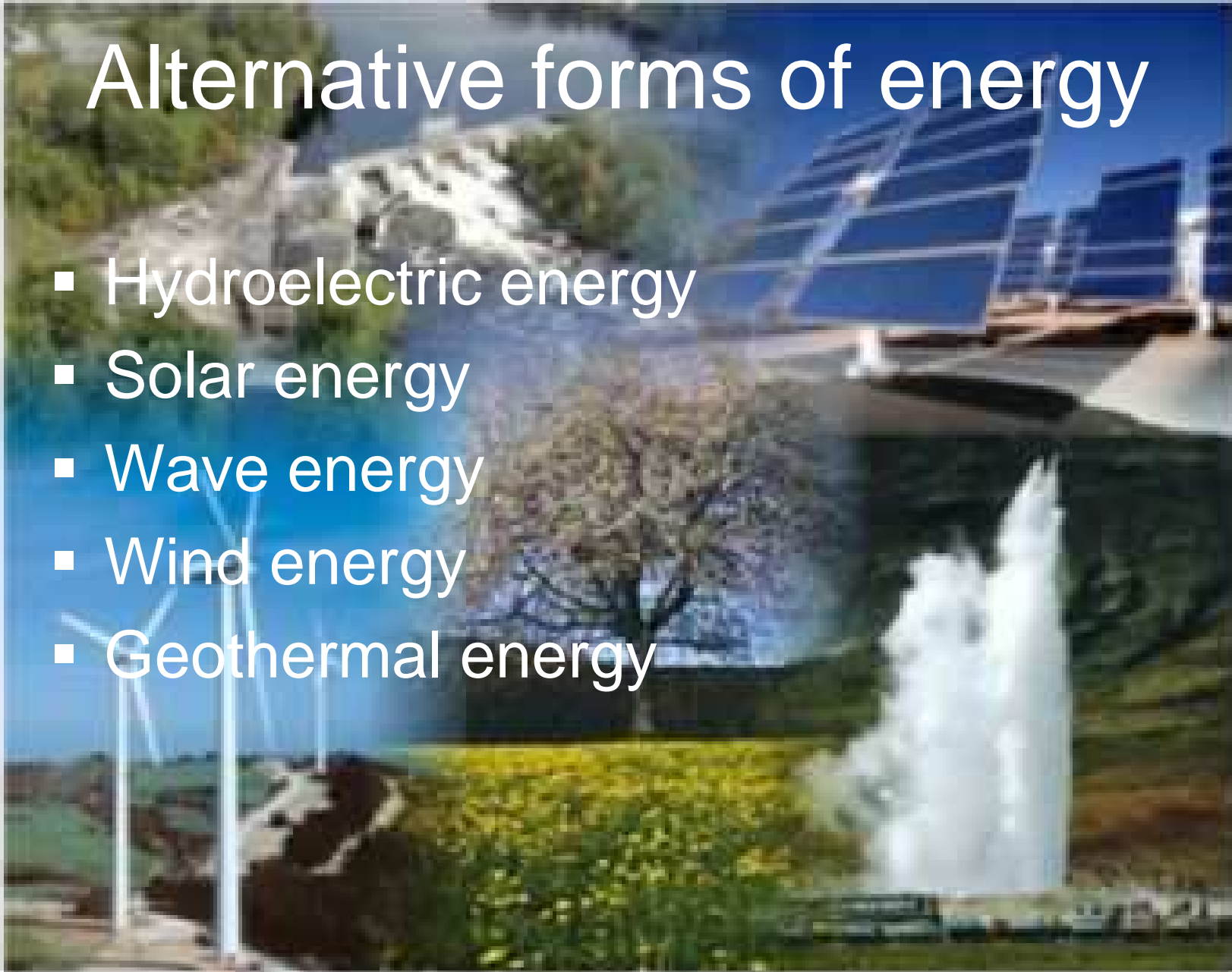
In order to have a sustainable development, government and people in general must speed up the use of renewable and clean forms of energy.

Portugal is no exception!



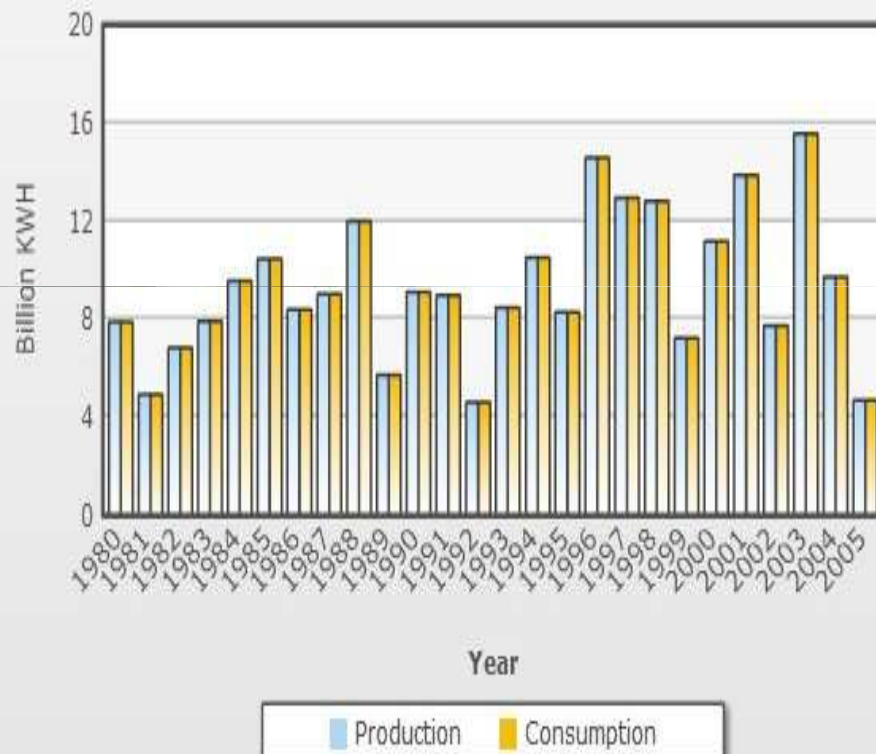
Alternative forms of energy

- Hydroelectric energy
- Solar energy
- Wave energy
- Wind energy
- Geothermal energy



Hydroelectric energy

Portugal Hydroelectric Power Production and Consumption by Year



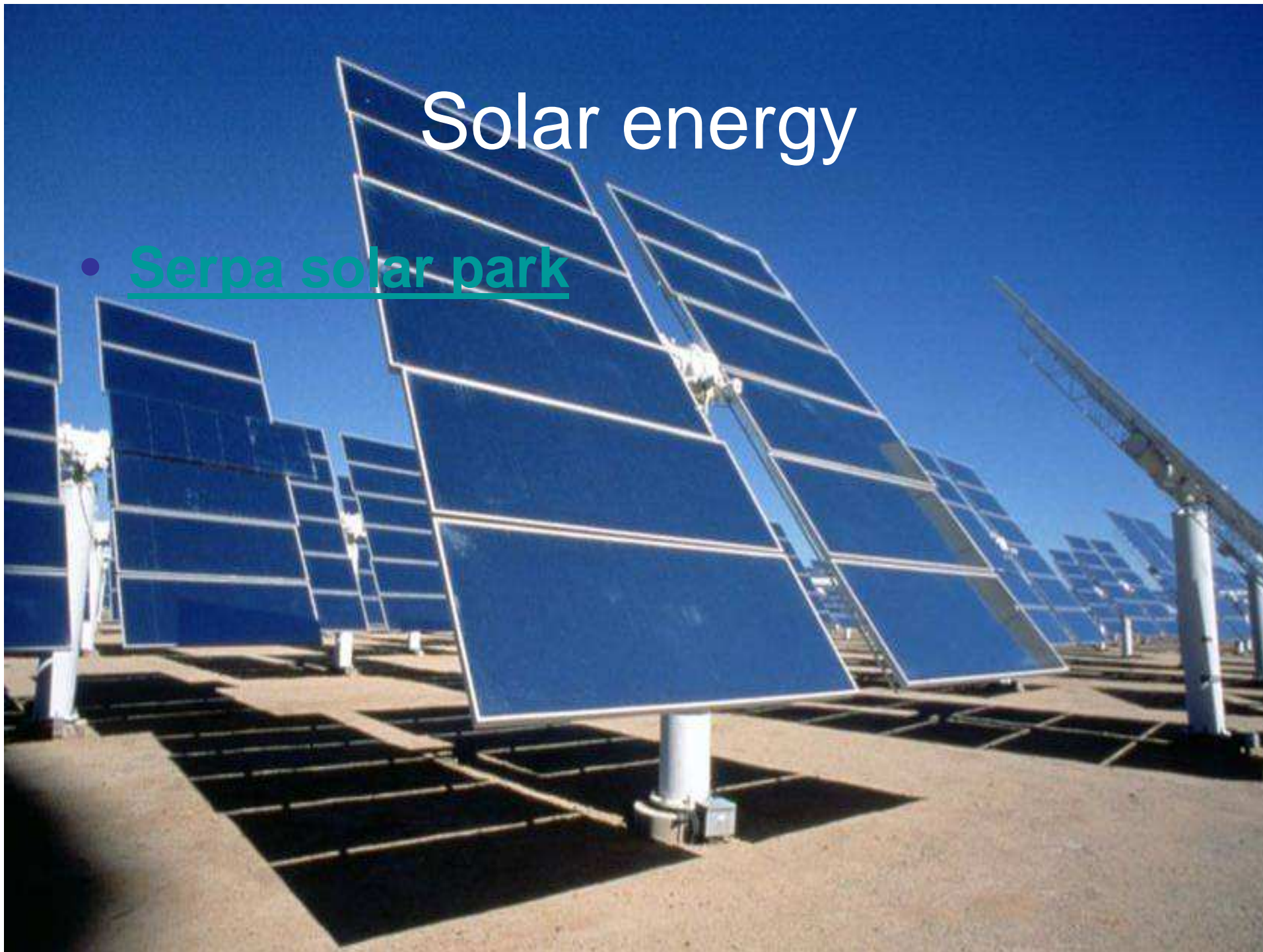
year	Production	consumption
1992	4.68	4.68
1993	8.45	8.45
1994	10.55	10.55
1995	8.26	8.26
1996	14.61	14.61
1997	12.97	12.97
1998	12.85	12.85
1999	7.21	7.21
2000	11.21	11.21
2001	13.82	13.82
2002	7.72	7.72
2003	15.57	15.57
2004	9.77	9.77
2005	4.68	4.68

Hydroelectric energy

- Hydroelectric energy is used a lot in Portugal and its production is variable according to the water that goes in the rivers. Portugal only uses what consumes.

Solar energy

- Serpa solar park



Solar energy



- Portugal's first large photovoltaic installation was opened in Serpa, an agricultural region.
- "The 11MW solar power plant uses 52,000 photovoltaic modules and costs around \$75million."
- It has been built among olive trees on hillside pasture, which will remain productive farmland because panels will be mounted two meters off the ground.
- This installation will produce electricity for 8,000 homes, saving more than 30,000t a year in greenhouse gas emissions.
- The project began feeding Portugal's electricity grid in late January 2007.

Wave energy

Aguçadoura wave park



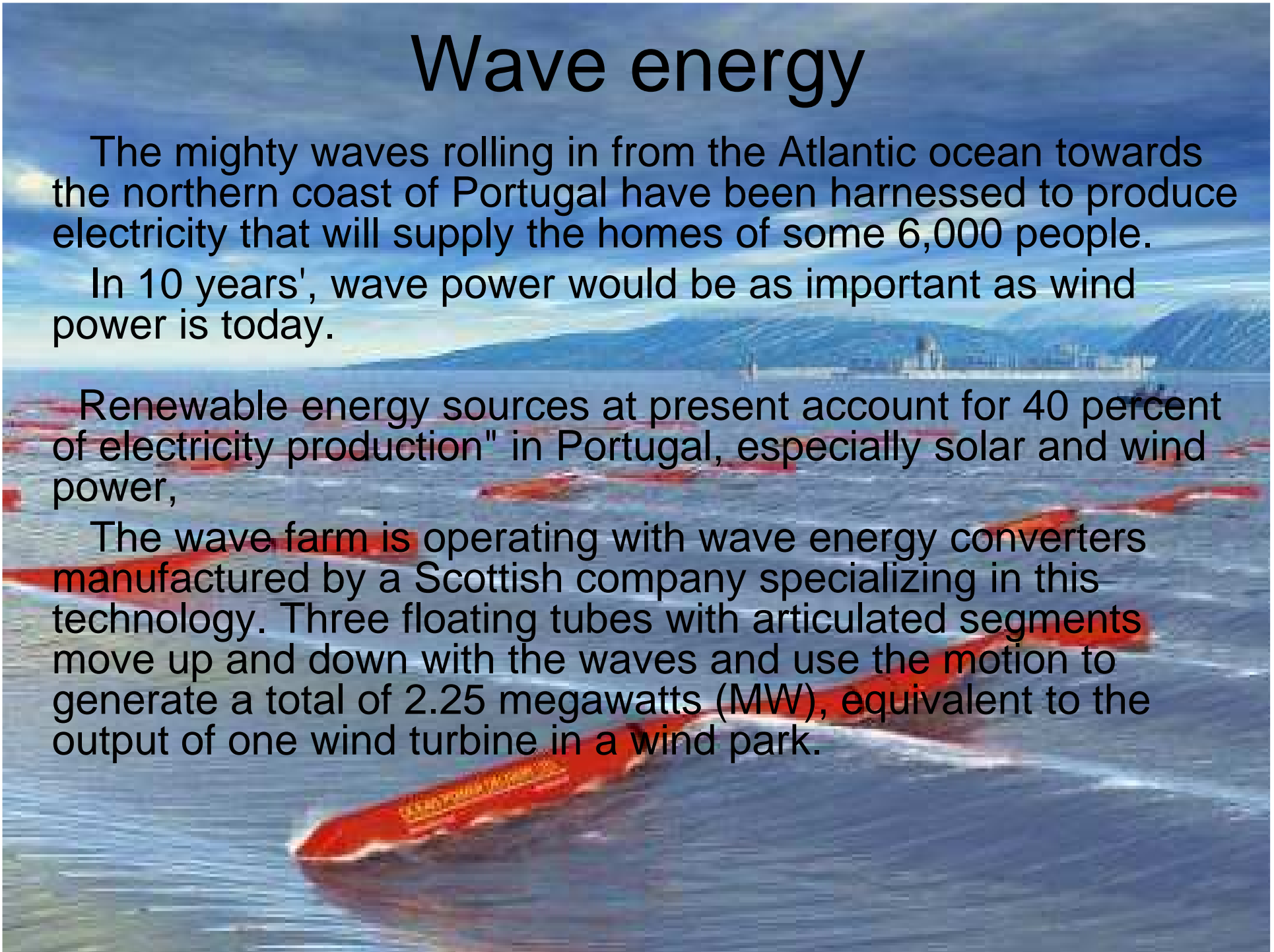
Wave energy

The mighty waves rolling in from the Atlantic ocean towards the northern coast of Portugal have been harnessed to produce electricity that will supply the homes of some 6,000 people.

In 10 years', wave power would be as important as wind power is today.

Renewable energy sources at present account for 40 percent of electricity production" in Portugal, especially solar and wind power,

The wave farm is operating with wave energy converters manufactured by a Scottish company specializing in this technology. Three floating tubes with articulated segments move up and down with the waves and use the motion to generate a total of 2.25 megawatts (MW), equivalent to the output of one wind turbine in a wind park.



Wave energy

The tubes float semi-submerged in the ocean, and are divided into three sections linked by hinge joints. When the hinged sections move with the waves, hydraulic rams inside the devices pump high pressure oil through hydraulic motors, which in turn drive electrical generators to produce electricity.

The kinetic energy harvested from the waves is thus converted into electricity, which is transmitted ashore along undersea cables and enters the national power grid.

Wind energy



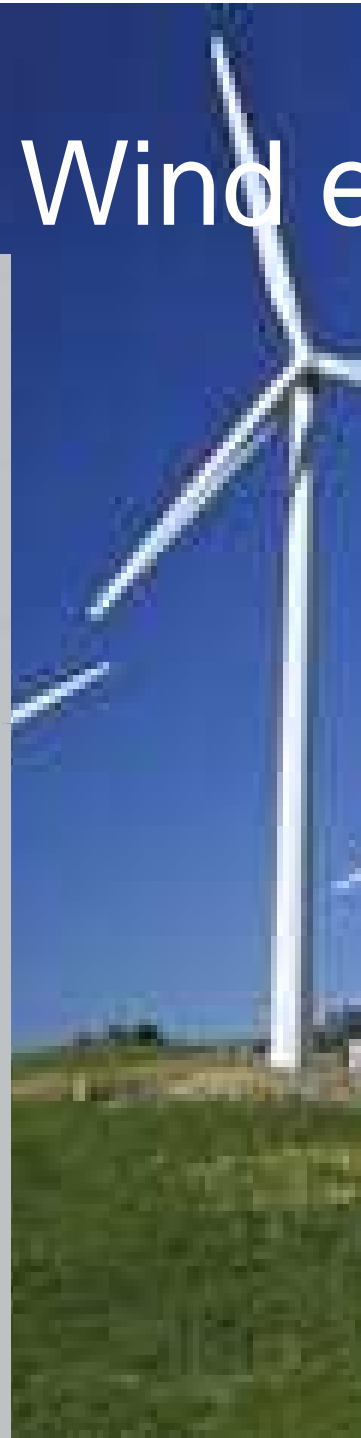
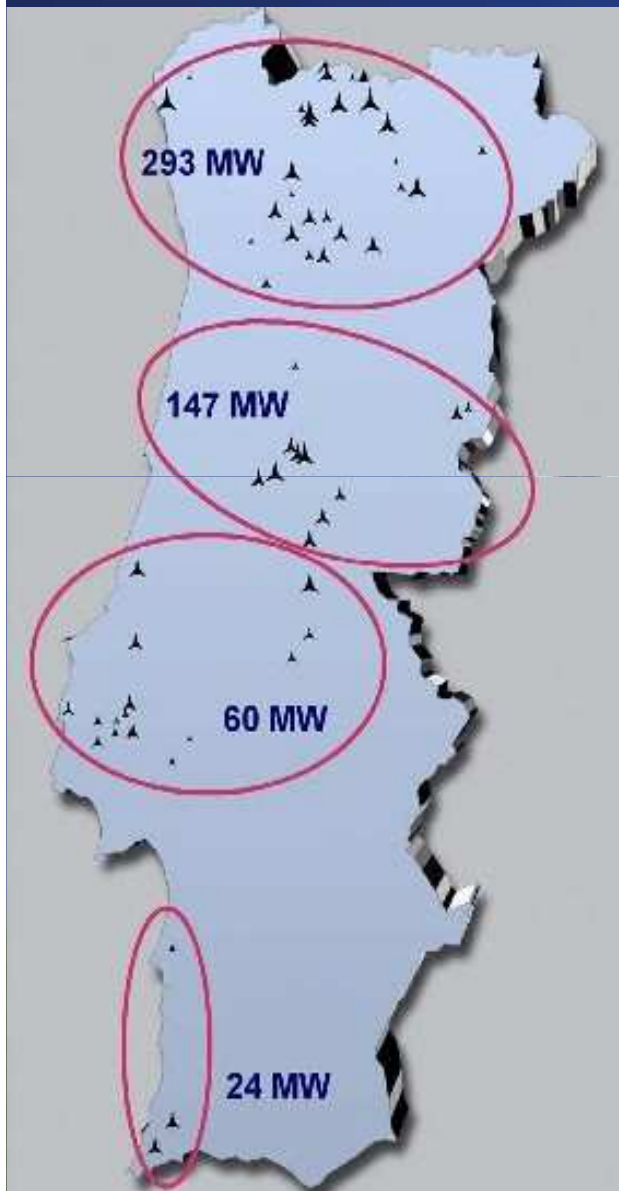
Portugal's Economy Minister Manuel Pinho inaugurated what was described as Europe's biggest wind energy park in the northern region of Viana do Castelo.

The Alto Minho park began generating energy a year ago, gradually increasing its production to the full potential.

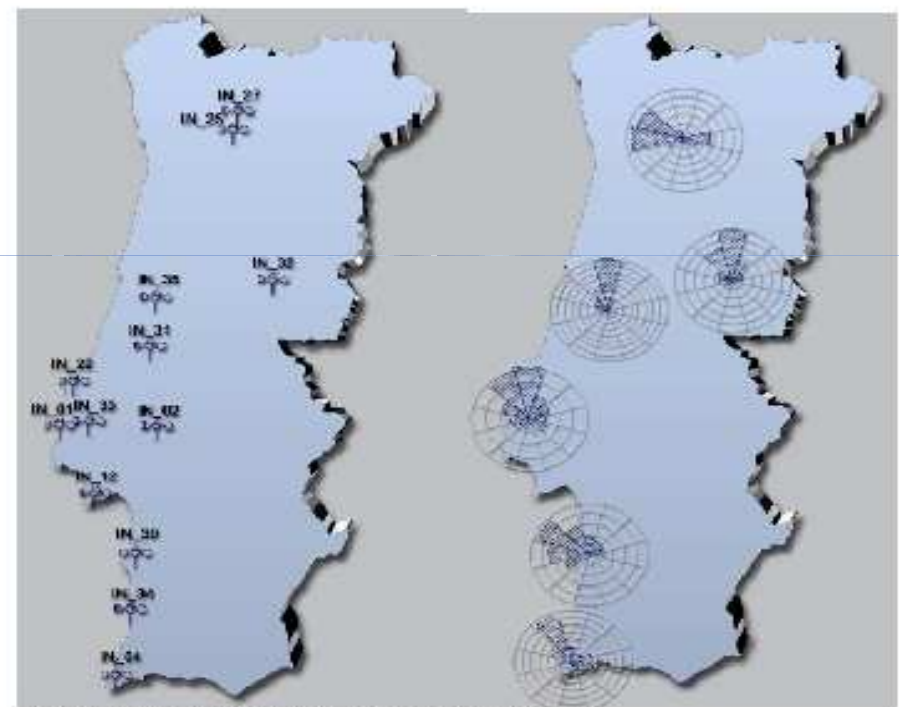
The 120 turbines divided between five sub-stations will produce 530 gigawatts annually or one percent of Portugal's energy.

The park, which costed 400 million euros (\$520 million), was expected to reduce carbon dioxide emissions by 370,000 tonnes annually.

Wind energy



Wind Climate and Energy Potential in Continental Portugal

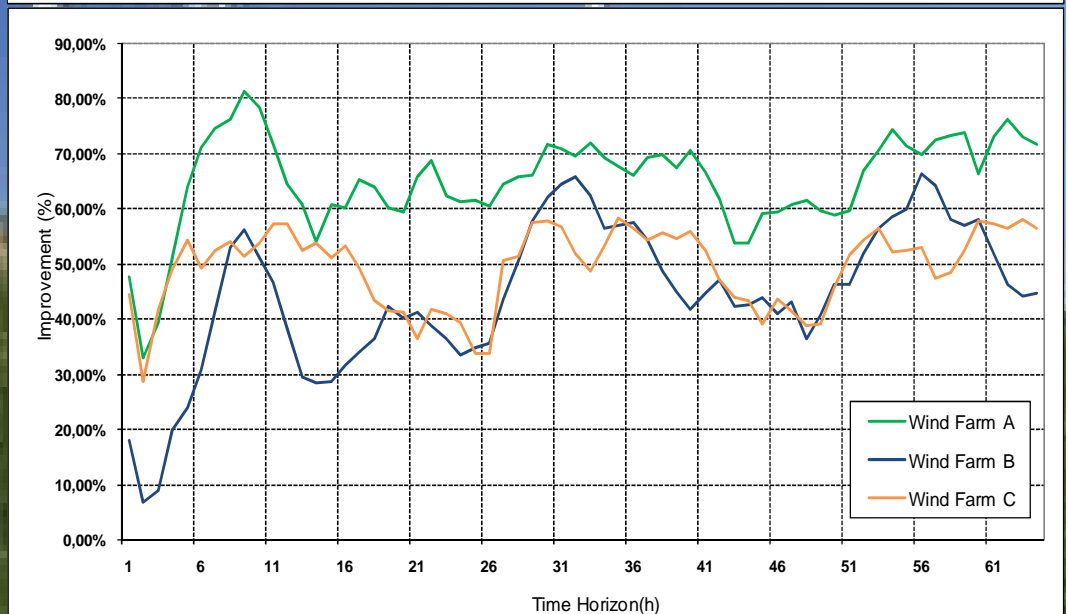
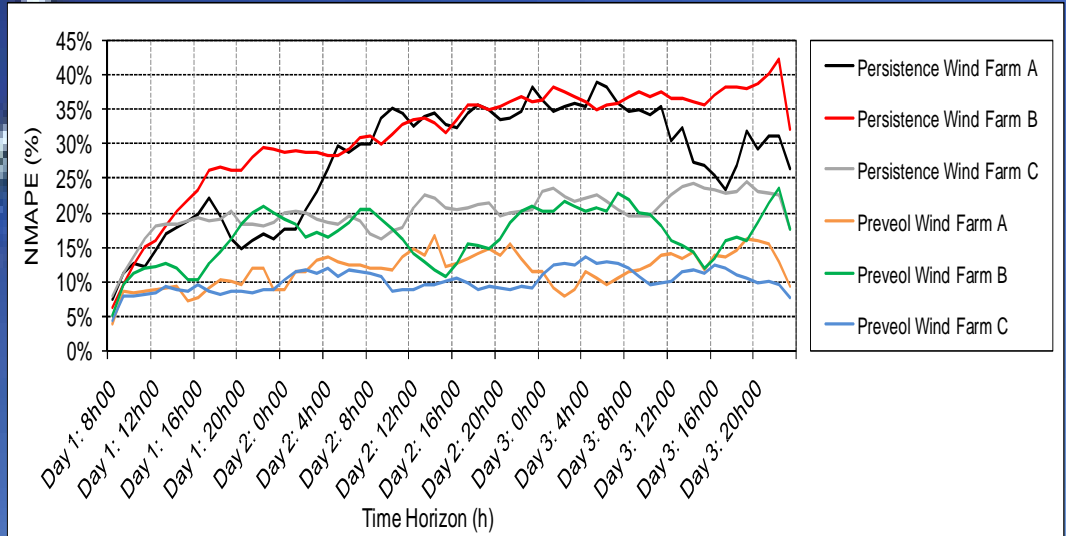


(INET) Anemometer mast network, source EOLIS database)

WIND POWER GENERAL DATA

Estimated Wind Potential in the Continent: > 3000 MW
Total Installed Wind Power: 193 MW
Wind Park in Projects Phase (licenced): >1000 MW

Wind energy



Wind energy

- The Alto Minho wind park is the biggest wind park in the North of Portugal. It cost 400 million euros and it produces 530 gigawatts annually - 1% of Portugal's energy

Geothermal energy

99 years ago the first geothermal power plant was born in Italy and since then, this highly efficient and ecologically friendly way of generating energy has slowly expanded and is now used by 21 countries worldwide.

The USA produces the most geothermal power of these 21, with Portugal (Azores) down in 17th place.

Geothermal energy has numerous advantages to the area in which the plant is built in. From a social point of view it provides many high-skill level jobs to the locality of the power station. Economically, it saves money on importing fossil fuels and, most importantly, it is good for the environment and reduces the need to burn other fuels.

Strategically, it increases the energy autonomy of the area and it is not affected by such things as the fluctuation in the price of oil.

Geothermal power plants are of considerable benefit to the area they are built in.

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