

Background of Portuguese Domestic Energy Consumption at European Level

Joana Sousa¹

¹ Faculdade de Engenharia da Universidade do Porto, Porto, Portugal
j.bastos.sousa@gmail.com

Abstract. The energy consumptions in households and the energy resources used for fulfilling the energy needs have been changing in a quite short period of time. The present study aims to provide a background of the energy consumptions in Portugal in a European context. A significant part of the energy consumptions is related to buildings. It is estimated that buildings use about 40% of all the energy needs in Europe. In that way, buildings, including households, play a major role in the energy consumptions in Europe. In Portugal the energy consumption of buildings represents about 30% of the final energy consumption of the country and actually electricity plays a major role in the households energy needs. In European households as well as in Portuguese households the energy required is mainly for cooking, for electrical equipment, for heating and cooling the houses, for domestic hot waters (DHW), and for artificial lighting.

Keywords. Domestic Energy Consumption, Energy Resources, Households.

1 Introduction

During the last decades the consumption of energy for heating has been reducing due to the introduction of more restrictive European regulations that pretended to reduce the consumption of energy in buildings [1, 2].

However, a decreasing tendency on global energy consumptions has been interrupted in the past 20 years [2] due to the introduction of new electrical equipment with the purpose of improving people's quality of life.

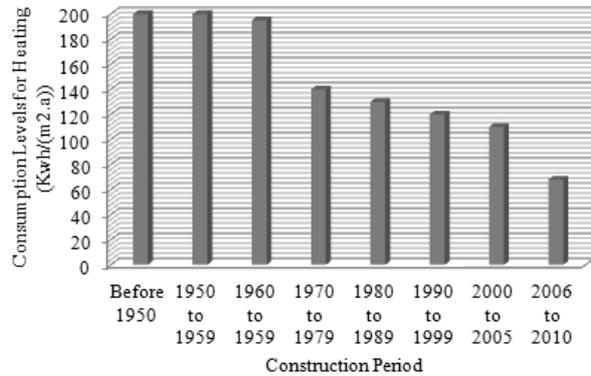


Fig. 1. Average Final Consumption Levels for Heating (kWh/(m².a)) by Construction Period in Portugal [2].

In European Union the residential sector represents about 40% of the total amount of energy used, which make it responsible for a significant part of greenhouse emissions at European level. It is expected that about a quarter of housing needs are still to build, and for that reason it is estimated that energy consumption in Europe will continue to increase until 2050 [3]. The majority of the energy is used in buildings built in the period between 1950 and 1975 (Figure 1). These buildings are the ones with bigger energy saving potential and simultaneously with higher needs of retrofiting. It is then necessary to develop new buildings more efficient using energy and make improvements in existing in order to substantially improve their energy performance.

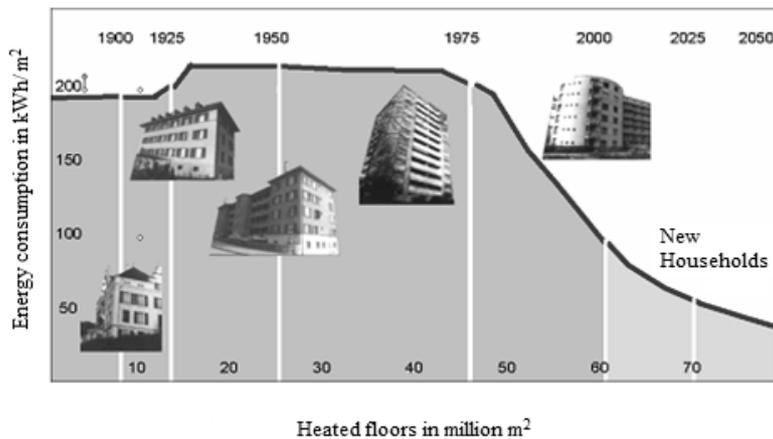


Fig. 2. Energy Consumed by the Buildings Constructed between 1900 and 2050 (forecast) [3].

In Portugal, the consumption of buildings represents about 30% of the final energy consumption. In 2010, about 17,7% was for household needs and about 12% was for energy needs in services buildings [4].

In the Portuguese household sector the consumption of electricity has been growing in the last decades due to the new consumption habits of the population. The residential sector depends mainly on electricity for satisfying people’s needs and it is produced through hydropower plants, fossil fuel thermal power plants and lately through renewable sources like the wind energy (Figure 3).

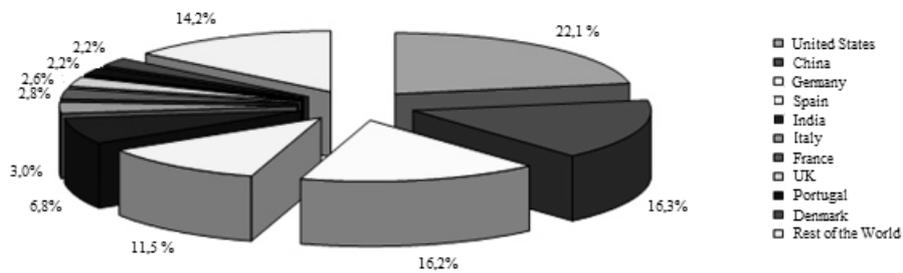


Fig. 3. Top Ten World Installed Capacity of Wind Energy in Percentage (%), 2009 [5].

2 Portuguese Building Stock Energy Characterization

2.1 Main sources of energy used in Portuguese Households

The Portuguese building stock is the third largest energy consumer (Figure 4). Nevertheless, in the last decades there has been a growing tendency on housing energy needs due to the introduction of several new equipments using electricity, which reflect a raise of people’s quality of life due to the improvement on economic conditions.

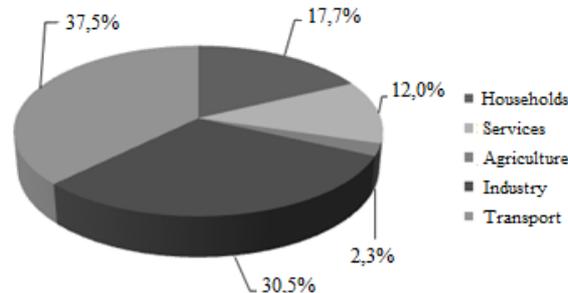


Fig. 4. Energy Consumptions in Percentage (%) of Portuguese main Economical Activities [4].

As mentioned before in the last decades there has been a profound changing on energy consumption habits in Portuguese families due to an economical favorable environment. With the increasing in economic power and the improvement of living conditions, people fit to have better comfort conditions which increased significantly the energy consumption in residential buildings.

In the Portuguese households the current main source of energy is electricity, representing about 42,6% of the total energy consumption [4]. Firewood is the second main source of energy, representing about 24,2% of the energy used in Portuguese households (Figure 5) [4].

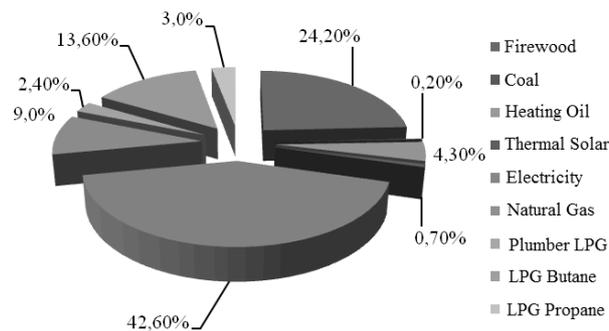


Fig. 5. Sources of Energy in Percentage (%) consumed in Portuguese Households [4].

The continuous growing of electricity consumption in Portuguese residential buildings leads to a major role of this energy source in the domestic sector, which is directly related with the increasing use of equipments using this type of energy but also with the use of electricity for heating. That can explain why electricity registered the greatest consumption evolution when compared with all other energy sources. In 1989 the electricity consumption represented 15,8% of the total energy consumption, while in 1996 it already represented about 41,9% of the total energy consumption in households.

2.2 Energy Consumed in Portuguese Households According with Utilization

Considering the different uses of energy in households, energy used in the kitchen has the highest weight, accounting for over one third (39%), followed by water heating with 23% (Figure 6).

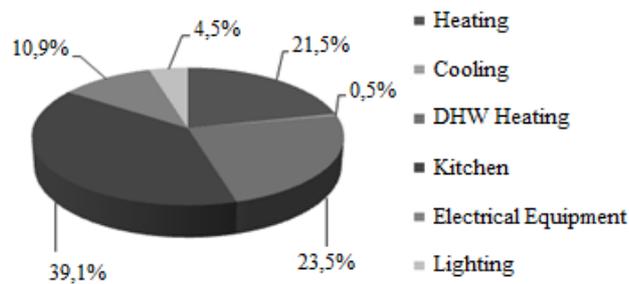


Fig. 6. Energy Consumes in Percentage (%) by Type of Utilization [4].

However, depending on the type of use, the dominant source of energy is different: in the kitchen dominates the use of electricity, while in water heating is predominant the use of bottled LPG (Liquefied Petroleum Gas).

Considering the final use of electricity, it becomes clear that consumptions in the kitchen and in electrical appliances were the highest, being respectively responsible for 41% and 33% of the overall electricity consumption in the reference period.

The energy used for heating and cooling of indoor spaces accounted for nearly one quarter (22%) of total energy consumption of housing in 2010.

3 European Domestic Energy Consumptions

In Europe the sum of energy consumption in the Residential Buildings (27% of all the European final energy consumption) and Services Buildings (13% of all the European final energy consumption) represents about 40% of the total final energy required in Europe and more than the transport sector, which had needed 33% of the total (Figure 7).

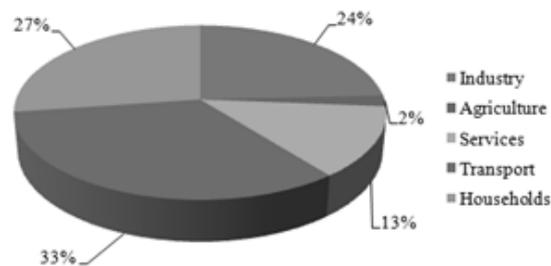


Fig. 7. Energy Consumes in Percentage (%) of European main Economical Activities [2].

Comparably with the energy consumption in households in Europe (independently if it is North & West, Central & East and South Europe), Portugal spends in households a much higher quantity of electricity (42,60%).

The sources of energy used in the South of Europe coincide with the major energy sources used in Portugal (Figure 8). However the implantation rate of renewable energy sources (RES) is not very significant in this region despite the good geographical conditions to explore some of the like, i.e. the solar energy.

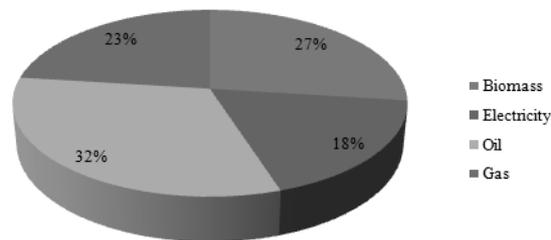


Fig. 8. Sources of Energy used in the South of Europe [2].

In Central and East Europe the Coal (41%) and the District Heat (29%) represent two of the major energy sources while in North and West Europe Gas (39%), Biomass (21%) and RES, District Heat (DH) and Liquefied Petroleum Gas (LPG) (21%) represent the main sources of energy. To note that in general the South region of Europe is more dependent on oil (32%) than Central & East Europe (3%) and North & West (20%) even being a region without oil resources.

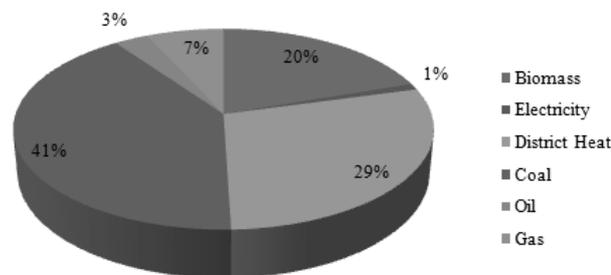


Fig. 9. Sources of Energy used in Central and East Europe [2].

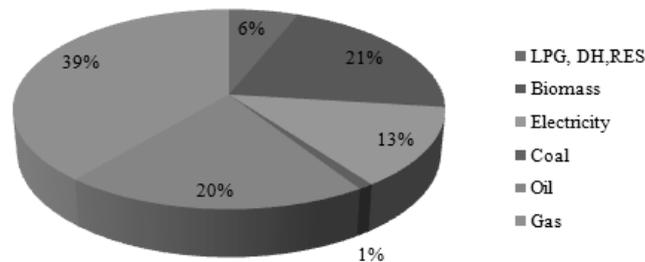


Fig. 10. Sources of Energy used in North Europe [2].

Once these countries haven't got fossil energy resources, a big amount of energy resources has to be imported, particularly oil, which is one of the most expensive energy resources. This fact it's not only harmful for the economy of these countries but also for the environment. Renewable energy resources represent 21%, 12% and 9%, respectively for Central & Eastern, South and North & West European regions.

4 Conclusions

The present study revealed that depending on the region the energy resources used could be very different and quantities can also show many variations.

One of the major conclusions is that, in Portugal, energy needs for any use in households are mainly supplied by electricity. Furthermore it is known that it is in the kitchen that the energy consumptions are higher due to the introduction of several electrical equipments, which have become essential in current days.

Besides the energy consumptions of kitchen equipments, there is also a significant amount of energy used for DHW heating and for heating and cooling spaces. In the future, energy needs for heating spaces will be reduced due to the introduction of constructive solutions that improve the quality of buildings envelope. However there are still a significant number of buildings in Portugal and in Europe built in a period of time in which thermal regulations were not in force. It means those buildings were not subject to a retrofit intervention and need more energy than buildings built according to thermal regulations.

These buildings represent a vast amount of energy that could be saved. In order to decide which should be the main actions and interventions to improve the situation, it is absolutely necessary to know the current reality. In the future energy saving in buildings will be a priority to control the importation of energy resources in countries as Portugal, which is strongly dependent on external energy resources.

5 Bibliography

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