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Public opinion on renewable energy technologies in Portugal

Fernando Ribeiro, Paula Ferreira*, Madalena Araújo, Ana Cristina Braga

Department of Production and Systems, University of Minho, Campus de Azurém, 4800-058 Guimarães, Portugal

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ABSTRACT

The public opinion on renewable energy technologies was analyzed by means of a survey implemented in Portugal. The survey addresses four technologies: hydro, wind, biomass and solar power. The results show that biomass is the least known technology, while hydro power is the most known. There is a generally positive attitude towards new renewable energy projects, and this tendency is more pronounced for solar power, while the case with lowest but still large support is the one of new hydro power plants. NIMBYism is more pronounced in municipalities with biomass, although not felt by the vast majority of their population. Solar power plants are regarded by the Portuguese public as the most desirable technology in terms of economic and environmental aspects, while hydro power is perceived as the technology that can contribute most to local residents' welfare. Willingness to pay is high among those who perceive renewables as increasing the costs of the electricity, but few respondents believe that renewables tend to raise the electricity bill. This study shows that the Portuguese are generally supportive of the development of more renewable energy projects in the country, and apparently these will not be subject to much local opposition excepting, perhaps, biomass.

1. Introduction

Electricity demand projections for 2030 in the EU (European Union) demonstrate the need for the construction of new power plants, due to the substitution of obsolete ones and to the increase of the electricity demand [1]. However, many uncertainties exist in the planning process. The nature of these uncertainties lie both in the costs associated with the technologies and in the prices of primary energy, often imported from geographically unstable areas and subject to even higher increasing demand in the developing world. Planning on the long run becomes then essential, since power plants require the investment of large initial capital sums and operate for long periods.

Planning assumes a variety of time scales and purposes. While the practical guide called roadmap2050 (http://www.roadmap2050.eu/, consulted on January 2013) is directed to a very long-term frame, the policies EU20-20-20, targeted to 2020, define concrete goals: (i) to cut in GHG (greenhouse gases) emissions to at least 20% below the 1990 levels, (ii) to reach 20% of renewables' share in the energy mix and (iii) increase energy efficiency in 20%. Therefore, RES (Renewable Energy Sources) are expected to play a significant role in the electricity generation mix, and policies have been successfully designed in order to do so [2].

Besides the cost uncertainty, the social and environmental aspects represent also fundamental dimensions to be included in energy decision making process both from the private and public perspectives. The increasing importance of RES on electricity production poses additional challenges for investors and decision makers. From the private investor point of view, ensuring public acceptance is fundamental to minimize the risk of cost over runs or even of failure and cancellation. Frequently, this public acceptance varies according to the technology and is related to local population financial compensations schemes but also to other elements such as local development or job creation. Also, from the public perspective these variables should be taken into consideration when designing sustainable energy scenarios for the next years recognizing electricity as a fundamental driver of social wellbeing and economic competitiveness.

The importance of RES for electricity production in Portugal is undeniable and it is then fundamental to analyze the social acceptance of all RES technologies, identifying major sources of concern and geographical patterns. This paper describes the implementation of a large scale survey in Portugal aiming to study five main research topics: (i) the level of acknowledgment that the Portuguese possess on the technologies under study, (ii) the position of respondents towards new renewable energy projects in the country, (iii) the validity of the NIMBY hypothesis in Portugal while

* Corresponding author.
E-mail address: paulaf@dps.uminho.pt (P. Ferreira).

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Nomenclature

NIMBY	not in my backyard
H	sample of respondents living in municipalities with hydro power
NH	sample of respondents living in municipalities without hydro power
W	sample of respondents living in municipalities with wind power
NW	sample of respondents living in municipalities without wind power
B	sample of respondents living in municipalities with biomass
NB	sample of respondents living in municipalities without biomass
S	sample of respondents living in municipalities with solar power plants
NS	sample of respondents living in municipalities without solar power plants
RET	renewable energy technology

realizing in which technology it is more pronounced, (iv) the perception that the Portuguese hold on Sustainable Development issues, regarding each of the four technologies and (v) the willingness to pay more for the renewables among the Portuguese people.

The present study addresses RES in Portugal, so the remainder of this section briefly introduces its past and present situation.

1.1. RES for electricity production in Portugal

During 2012, demand of electricity in Portugal was 49 TWh [3]. As can be seen in Fig. 1, the special generation status technologies, an umbrella for subsidized technologies, represent the greatest part of generation, followed by thermal (natural gas and coal) and large hydro. The imports from Spain are higher than exports and represent 16% of total supply. The special generation status include, besides the ones we address in our study (wind, biomass, solar and hydro), some other technologies such as urban waste, biogas and non-renewable cogeneration. In 2012, 74% of special generation status came from renewable energy sources [4]. If we exclude imports, the ratio of produced renewable energy in 2012 amounted to 47%.

Fig. 2 presents data concerning renewable energy in more detail. Portugal achieved the EU target for RES in 2010, reaching, a share of

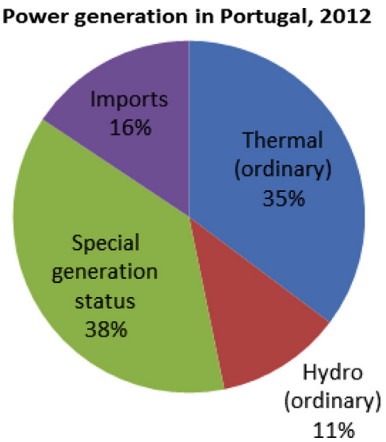

Fig. 1. Electricity production shares, by technology, in 2012. Own elaboration from REN data [3].

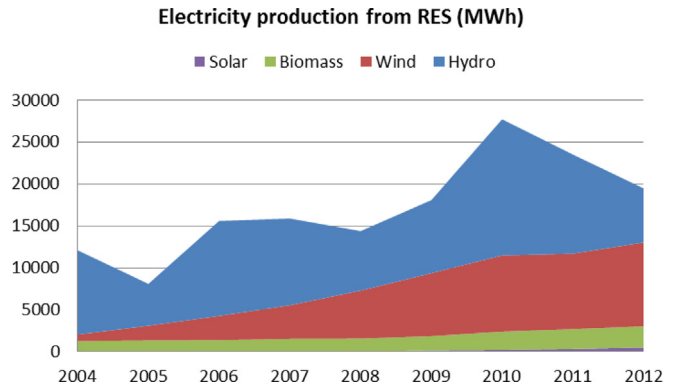

Fig. 2. Energy production in Portugal, 2012, using the renewable energy sources addressed in the present study: hydro, wind, biomass and photovoltaics. Own elaboration from Ref. [4].

39% renewable energy in the electricity sector. The other successful countries achieving these goals were Denmark, Germany, Hungary, Ireland, Lithuania and Poland [5]. In that year, together, the Member States achieved 12.7% of renewable energy quota, but the goal for 2020 is 20%, so further improvement is still needed.

The evolution of energy produced from RES has been increasing but not steadily. As the most significant part of it is based on hydro power, it is therefore, subject to the profile of the rain (the so-called hydroelectric productivity index) in a given year.

Feed-in tariffs are presently the support policy used in Portugal to promote RES for electricity production, given that free market would constrain their use as they are still economically less attractive than the traditional technologies. Among renewable energy technologies, the exception to this rule is hydro power. These plants have been playing a significant role in Portugal since the 50's and are mostly operated outside the feed-in tariff schemes. In the end of 2012, the total installed hydro power in Portugal was 5540 MW [4]. From these, 94.5% of the installed power refers to power plants not included in feed-in tariff schemes (Ordinary Regime Production); only 5.5% of total installed power refer to small units, subject to feed-in tariffs and included in the special generation status [3].

Among the remainder renewable energy sources, the most prominent one is wind power. The first wind farm was built in Portugal in 1992 and since then the growth of the installed wind power has been exponential. At the end of 2012, total wind power achieved 4194 MW [6]. According to the Portuguese Renewable Action Plan, this number will increase to 5300 MW in 2020 [7].

Biomass can be very heterogeneous but may be divided in two types: a first one where the origin of biomass is the forest or agriculture (dedicated production), or a second type where biomass results from the processing of primary biomass, including residues, waste and subproducts [8]. In some cases, the power plant may generate an amount of heat that is useful for industrial purposes besides the electricity. Currently Portugal has 462 MW of biomass installed power, among which 348 MW exist in cogeneration mode [9].

Installed solar power in Portugal, in 2012, was 360 MW [4]. Among these, the units that can be considered "solar power plants" or "solar farms" are 17 (besides two in the island of Madeira, not addressed in the present study) and represent 141 MW. Among these units, the largest has 45.8 MW installed [9].

The remainder of the paper is as follows: in Section 2 we address the survey design and implementation, in Section 3 we describe the main results of the survey, in Section 4 the results are discussed and compared to other studies from the literature. Section 5 presents and the main conclusions and future research.

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