INTRODUCTION

Selected papers from the XV Annual Conference of the Spanish Association for Energy Economics

One of the original goals of this journal is to make available to the energy sector, and to society in general, the advances that take place in the research of the major aspects of the energy transition. This is what we have been doing up to now, presenting in the different issues the contribution of world-renowned experts.

But I think that, as part of that goal, we should also disseminate the quality research that is being done in Spanish centers, often by junior researchers. To that end, *Papeles de Energía* has agreed with the Spanish Association for Energy Economics to award a prize to the three papers presented at their annual conference that best contribute to the dissemination of knowledge about the energy transition.

The Spanish Association for Energy Economics (AEEE), founded in 2004, is the Spanish affiliate of the International Association for Energy Economics. It is formed by professionals from academic, business and public administration institutions who think that economic science has much to say about the approach and solution of energy problems.

Its goal, to a large extent coincident with that of this journal, is to promote economic debates, help energy economics professional get together, and disseminate knowledge in this field. To achieve that, the AEEE carries out different activities: an annual academic conference, a map of researchers, a newsletter, as well as different workshops about topics relevant to the energy sector.

The papers presented in this issue were selected at the XV Conference of the AEEE, which took place in Toledo in January 2020. We would like to thank the enthusiasm with which the AEEE approached this collaboration, as well as all the authors that presented their papers to the prize.

In the first paper, **Paulino Martínez**, **Fernando de Llano** and **Anxo Calvo**, from Universidad de La Coruña, show us how to incorporate modern portfolio theory, which was initially developed to select financial assets portfolios, to energy planning, so that not only the cost of the different options, but also their risks (measured as cost volatility) are taken into account in an efficient way.

The authors identify the efficient energy generation portfolios for Europe in 2030, 2040 and 2050, both in terms of cost and of risk, finding some interesting results. The first is that the progress towards a more decarbonized portfolio also brings about a reduction in costs, and in risk (a reduction that is larger when fossil fuels, with volatile prices, disappear from the portfolio). The European generation portfolio which minimizes risk reduces the contribution of coal and natural gas, and replaces them with wind and solar photovoltaics. Nuclear and hydro energy keep their shares along the horizon considered, something that is clearly at odds with the current perspective about these technologies. Nuclear and onshore wind are the two technologies with the largest contribution to this portfolio. Also, CCS has a role from 2030 on. When the goal is to minimize costs, the role of nuclear and onshore wind increases, whereas large hydro disappears.

It is also interesting to note that when decarbonization progresses, the diversification of the portfolio decreases, something that could intuitively be considered as non desirable… but which is not, to the extent that the diversification problem is transformed from one about technologies to one about sites, which are the ones that must be diversified geographically to minimize the risk of renewable energy production.

Although, as the authors point out, the analysis could be further sophisticated, I believe that their research shows well the convenience of using multiple criteria to face such a complex problem, and with so many uncertainties, as long-term energy planning.

One of the most important elements when designing decarbonization policies for transport is understanding how agents choose among the different available transport modes. **Alessandro Silvestri, Sébastien Foudi** and **Ibon Galarraga,** from BC3, look in their paper at the modal choices for regular trips in five European countries, and at the factors that influence them (including policy). They run a survey to households in Hungary, Italy, Norway, Poland and Spain, in which they ask about the typical trips for households and for the transport modes they use for them; about their preferences for the different attributes of these transport modes; and about their attitudes towards policies and related issues.

One of their most important conclusions is that heterogeneity plays a large role: the agents surveyed are very different in their preferences and demand for mobility, and this should be incorporated into public policies, so that they do not become ineffective and inefficient. Hence, the authors show us significant differences in the private use of vehicles depending on age, gender, studies, or the type of city in which they live. Some relationships are common among countries, whereas others vary significantly. For example, it is noticeable the large share of active transport in Spain compared to the rest to buy groceries, leisure, or to move with kids, something that might be explained based on the different urban configuration, or even on the school allocation procedures. It is also interesting to see how the income level (or the educational level, very related) determines the use of private vehicles to take kids to school, but not so much to go to work (although this effect is larger in lower-income countries).

Regarding the factors that determine modal choice, the most important are reliability, safety, and availability. The time of the trip is valued more than the cost. Environmental impacts, on the contrary, are considered to be less relevant. It is very interesting how these factors and modal choices are connected: the use of private vehicles is mostly associated to comfort and privacy, whereas public transport is associated with higher sensitivity to costs, and is generally perceived as less comfortable, less safe and less reliable. Toll-based policies are the less popular, whereas urban design or emission standards are the most valued.

Finally, **Dirk-Jan Van de Ven** and **Ignacio Cazcarro**, from BC3 and ARAID respectively, offer a highly relevant assessment of the impact that the renewable

energy deployment associated with decarbonization strategies for 2050 may have on land use, and of is consequences. As they point out, renewable energies, which present many advantages compared to fossil fuels, have a major drawback in their lower energy density, and indirectly, their larger land requirements. In a context of competition for the use of land (to produce food, or to sequester carbon emissions), it is very important to estimate the extent to which renewable energy deployment may affect these issues.

The authors have developed a module within the GCAM model, a well known integrated assessment model that links energy, land, socioeconomic and climate systems. Based on the efficiency in the use of land of solar and biomass energy, Van de Ven and Cazcarro estimate, for each water basin in Spain, how the use of land for energy competes against other uses.

Their conclusion is that the growing use of solar and biomass energy in Spain could result in a significant pressure on the use of land in the future. Solar energy would use 0.9% of land under the different assumptions considered. Biomass could use between 3.3 and 3.7%, depending on the availability of water and fertilizers. In general, they also observe a general trend towards reforestation in Spain. The limitations to the use of water and fertilizers produce, in the case of biomass, a reduction in the amount of land used for this purpose, whereas, in the case of solar energy, they result in a change in the type of land used. These changes in the use of land would result in significant changes in carbon sequestration, land rents, and the use of water and fertilizers. Therefore, this issue should clearly be incorporated into the analyses and strategies for the decarbonization and energy transition of the Spanish economy.