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Rebuttal letter to the article entitled: "Spatial planning to estimate the offshore wind energy potential in coastal regions and islands. Practical case: The Canary Islands"

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ABSTRACT

The objective of this rebuttal letter is to provide a critical analysis of the article entitled "Spatial planning to estimate the offshore wind energy potential in coastal regions and islands. Practical case: The Canary Islands" [Energy 143 (2018) 91–103], mainly in relation to its methodology, suitable marine areas and electricity production costs. The absence of basic considerations about the characteristics of the insular power grids, the composition of the electricity costs in the Canary Islands, and the lack of rigor in some assumptions related to visibility constraints, offshore costs, integration costs, the mixing of data from different time periods and the references used, provides unrealistic and useless results for a necessary debate about the potential of offshore wind energy in the Canary Islands. In this rebuttal letter we will also demonstrate that the potential offshore wind capacity calculated by the authors is much lower. Moreover, the assertion that the electricity cost from offshore wind calculated by the authors is lower than the current electricity cost is wrong and, in fact, the cost of electricity from offshore wind is higher in the time period when the analysis was made, and also at present.

1. Introduction

Electricity from offshore wind energy is growing substantially around the world (14,086.3 MW in 2016 [1]), mainly in developed countries with marine territorial areas where a shallow continental platform permits the placement of such devices not interfering with other marine activities and avoiding substantial environmental concerns.

In Canary Islands, the debate about the location of offshore wind farms in future is growing because of the limited surface available onshore. There exists a growing desire for achieving a 100% electricity production from renewable resources, but also a growing concern about the location of wind farms onshore and the environmental impact associated for islands economically based on touristic activities. Then, the option of moving the future wind farms to marine locations is being promoted by the regional government [2].

The article entitled "Spatial planning to estimate the offshore wind energy potential in coastal regions and islands. Practical case: The Canary Islands" [3] attempts to answer the question about the potential of offshore wind energy in the Canary Islands and electricity cost associated. However, the absence of basic considerations about the characteristics of the insular power grids involved, the composition of the electricity costs, and lack of rigor in some assumptions related to visibility constraints, offshore costs, integration costs, the mixing of data from different time periods and the references used provides unrealistic and useless results and conclusions for a necessary debate about the potential of offshore wind energy in the Canary Islands. Also, the cited Energy Strategy of the Canary Islands is a draft paper still under preliminary discussion [2], and it is being revised after the allegations of different entities.

Below we will explain in more detail our assertions by means of the same sections as the article rebutted.

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2. Suitable marine areas

It is not understandable how the authors select a maximum bathymetry of 500 m for the study but, in parallel, the floating wind turbines selected for the cost analysis are restricted to a maximum 125 m water depth. Also, none of the previous analyses reported by the authors consider water depths larger than 200 m. The authors justify this selection as they expect this article to serve as a long-term energy planning instrument (until 2050 and beyond), expecting also that in future the floating offshore turbines will operate in up to 500 m depths. However, the wind turbine selected for the study is currently in service in one of the Canary Islands (Gran Canaria) and the article is not providing any insight about the long-term evolution of the offshore wind turbines technology, when the average turbine sizes for new projects globally are expected to increase from about 4 MW in 2016 to almost 8 MW in 2022 [4].

Also, visibility constraints limited to 1 km in the work are not understandable, as coastal areas are very sensitive for the Canary Islands economy. Indeed, 13.1 million international tourist visited the Canary Islands only in 2016 [5]. Thus, many of the most favorable coasts, where substations are close to the shore, are also urban areas mostly devoted to touristic activities and nautical sports. Moreover, the Canary Islands have a very high population density (289 inhabitants/km^2 [6,7]), mostly placed in coastal areas, as these are more suitable for economic activities. Additionally, a substantial share of the island's surface (40.45% [8]), covering most of the unpopulated coast, is environmentally protected. We consider that a good approximation for considering visibility constraints should be to apply some of the intern boundary restrictions that the authors found in the literature and exposed in Table 1 to coastal urban areas and coastal protected areas.

It is also important to mention that Canary Islands territorial waters are strongly protected by the European Union in Red NATURA2000 [9,10] and it is expected that this protection will increase in the near future [11]. These protection areas were updated in 2011 [11] and have been not properly considered in this paper. For example, all the north of La Gomera is ZEPA (Special Protection Zone for Birds) is protected (Fig. 1) [9], contradicting the planning of offshore wind farms exposed in Fig. 6 and the spatial restrictions of Table 2 of the paper rebutted.

Moreover, based in the INDEMARES project [11], the Spanish Government is planning to add two new protected areas in 2019 to the Red NATURA 2000 (Fig. 2) that, added to the previous protected areas, will prevent almost all the coastal areas surrounded by Fuerteventura and Lanzarote to be considered for offshore wind without environmental actions to prevent any affection to the ecosystems located in these areas. Of course, these affections do not exclude offshore wind energy, but increases the cost of any offshore wind farm project to avoid any environmental impact maybe to the point of making it unprofitable.

Fig. 2. New protected areas proposed by the Spanish Government to be added to the Canary Islands protected coasts in 2019 [11].

Then, the planned areas for offshore wind farms in the Canary Islands (Fig. 3) that were considered in this work for reaching the 57.23 GW offshore power that could be installed, and based in a previous work produced at Universidad de Las Palmas de Gran Canaria [12], are not properly considered and the cost of many of them may increase considering environmental actions to prevent affections to the ecosystems located in them.

3. Wind farm configuration and turbines placement

It is important to note that the authors do not consider buffers

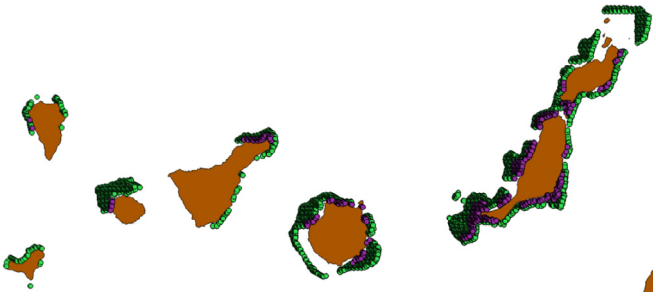

Fig. 3. Planned areas for the off-shore wind farms considered in the previous works [3,12].

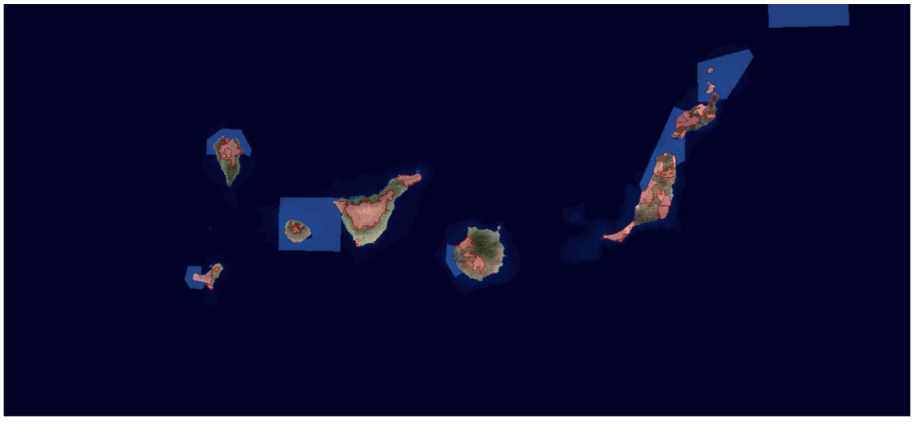

Fig. 1. ZEPA (Special Protection Zone for Birds) areas in the Canary Islands [9].