Cost of generation for island territories using offshore wind installations. A case study in the Canary Islands (Spain)

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1. Introduction

Electricity generation costs for islands using conventional generation systems are higher than those for continental systems. In the Canary Islands, the average cost exceeds 200€/MWh. The exploitation of offshore wind energy in small island territories where land availability is scarce may be a feasible option for reducing this cost.

As a result of its volcanic nature, the orography of the Canary territory varies considerably and bathymetric mapping of the offshore area reveals significant peaks and troughs which make their study and analysis necessary to determine compatibility with the different support structure technologies, see *Image 1*, in use today for offshore wind turbines [1,2].

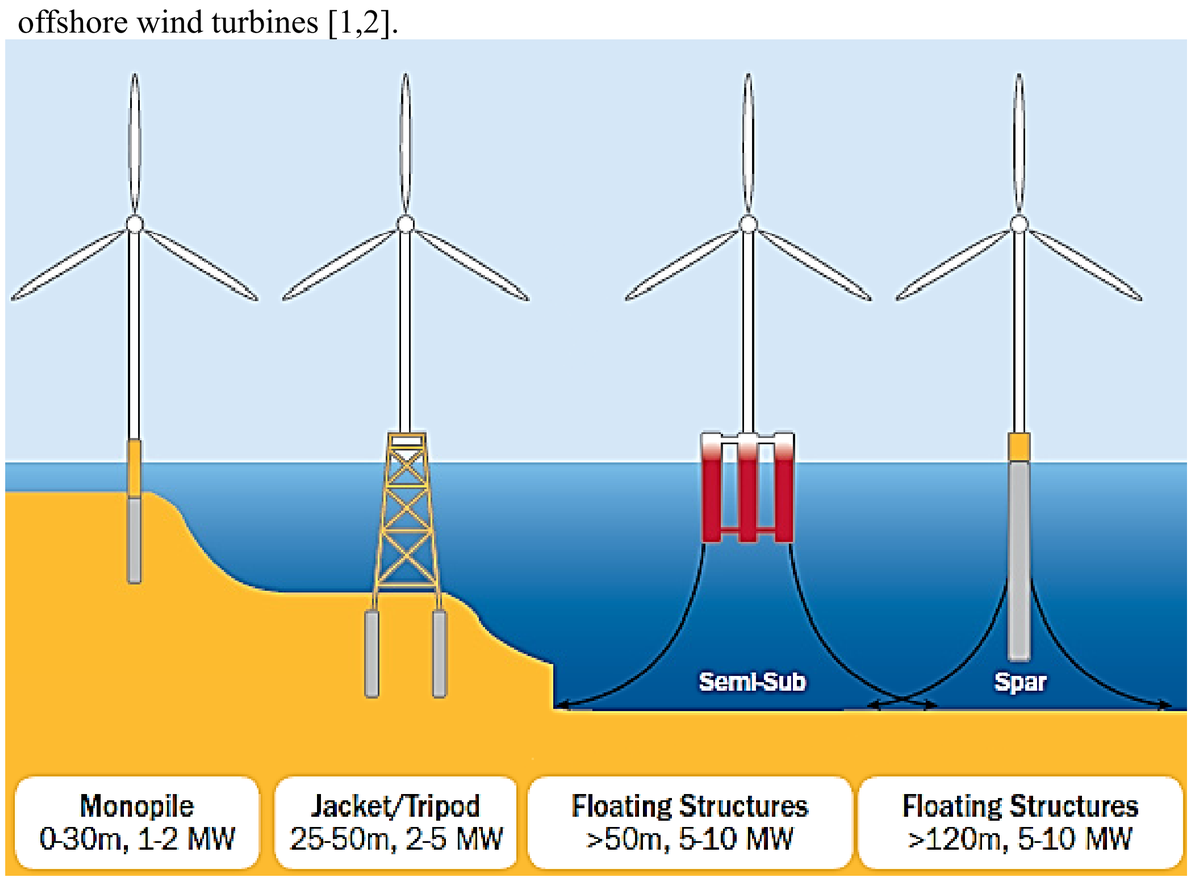

Image 1: Technologies studied for the offshore wind farms .
(Author: Principle Power)

The aim of the present paper is to study the feasibility of installing offshore wind turbines in a specific southeastern area off the island of Gran Canaria (*Image 2*). For this purpose, different support structure technologies will be studied [1,2] and an analysis made of their compatibility for the specific area under study.

The cost of electricity generation will be calculated for each type of technology and a comparison made with the cost of conventional electricity generation for the island.

Image 2: Enviromental and Technical restriccions in the Study Area
(Author: RedMic, GrafCan).

2. Experimental

In this paper, bathymetric and wind power data, *Image 3*, have been used provided by the Autonomous Government of the Canary Islands. Based on a study of this data, it was possible to select the different feasible support structure technologies. A Vestas V105/3.45MW wind turbine model was chosen to estimate the electrical energy generated by an offshore wind turbine.

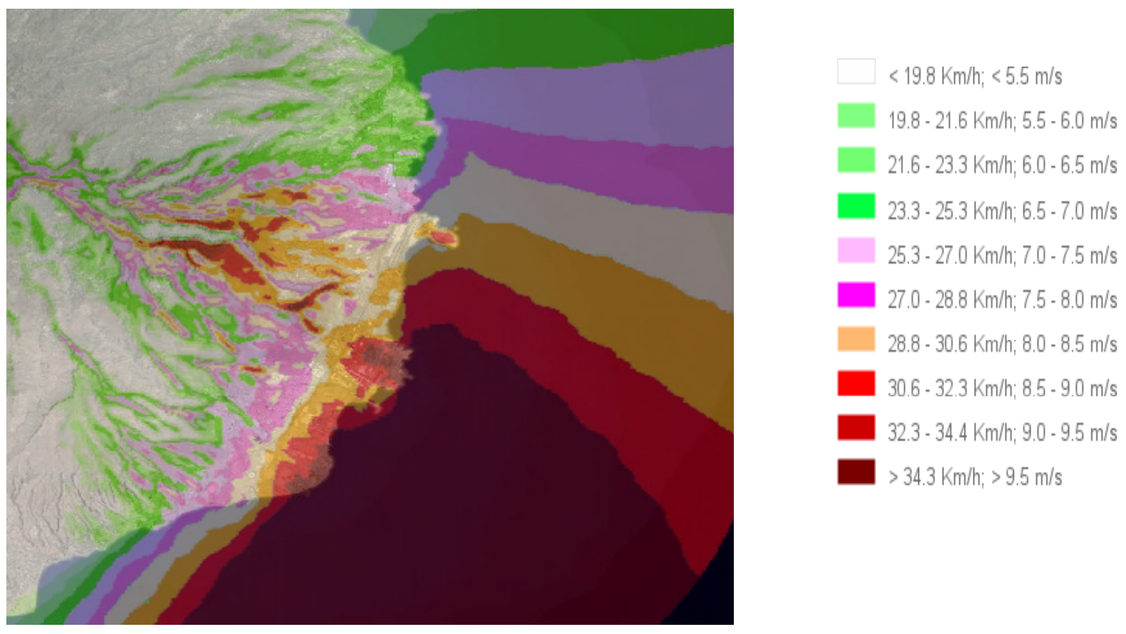

Image 3: Potential of the wind resource in the study area.
(Author: Government of the Canary Islands)

Based on knowledge of the investment, operating and maintenance costs, as determined for each support system technology [1,2], calculation was made of the Levelised Cost of Energy (LCOE) in €/MWh.

3. Results and Discussion

The estimations of mean energy performance made for the different sites studied in the specific selected area ranged from 3500 MWh/MW to values above 4500 MWh/MW.

Bearing in mind the variation in investment, operating and maintenance costs according to the support system technology used, the Levelised Cost of Energy values that were obtained ranged between a minimum of 35.7 €/MWh, for the Monopile technology, and a maximum of 95.2 €/MWh, for the Hywind technology (Spar).

4. Conclusions

The costs of electricity generation using offshore wind installations in the study area are competitive with generation costs using conventional systems. For the particular case studied, the specific saving in the cost of electricity generation could be as high as 164 €/MWh.

5. References

[1] B. Möller, L. Hong, R. Lonsing, F. Hvelplund. *Evaluation of offshore wind resources by scale of development.* Energy 48 (2012) 314-322.

[2] C. Bjerkseter, A. Ågotnes. *Levelised cost of energy for offshore floating wind turbine concepts*. Department of Mathematical Sciences and Technology, University of Life Sciences; 2013.

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