

Logistics and fabrication study to assess commercial delivery of the WindFloat in the East Coast of USA

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Abstract

With the WindFloat, Principle Power leads the floating offshore wind technology market. The semi-submersible platform has successfully demonstrated its capabilities throughout 5 years of working in the North of Portugal and the company now faces the next steps to commercialize the technology.

This research study is looking to the future projects of the company and aims to establish the requirements that port facilities must fulfill in order to be capable of holding a serialized fabrication of WindFloats. Moreover, by using the premise of a potential 500 MW project in Massachusetts, East Coast USA, this report studies the fabrication process and costs, and designs a suitable strategy for satisfying the platform demand. By fabricating the basic components in Portugal and shipping them to the East Coast of USA (Bridgeport, CT) for final assembly and turbine mating, the research estimates a cost of fabrication of 7.12 M€/WindFloat. This cost is significantly lower than the current cost for pre-commercial projects due to learning curve and large-scale fabrication.

Further on, the report takes a more thorough look at the final assembly process in terms of time and cost of labor. It offers an explanation of the duration of operations and allocates the minimum necessary resources, reaching a conclusion on the number of people to hire and the impact in the cost, all of this in order to deliver a unit every 3 days. To conclude, the study goes further to show an LCOE computation, resulting in an estimated cost of 113 €/MWh, considering a 25 year business case for the wind farm.

Keywords: WindFloat; Fabrication; Principle Power; Massachusetts Wind Energy; Offshore Wind; Floating; LCOE; Gantt.

1. Introduction

Offshore wind energy presents several advantages as a renewable energy source. Offshore wind plants can obtain energy from higher intensity and more consistent wind. In addition, aesthetically and practically speaking, offshore wind farms don't have any visual or noise impact on people, being far from populated areas. [1].

Leading countries in Europe regarding this technology are UK and Northern countries [2]. China, on its side, also counts with 1 GW of installed capacity and presents a target of 10 GW for 2020.

There is, however, a long way to go, as there are many emergent markets that have promising offshore wind capacity, such as USA, Japan or the Republic of Korea. In particular, the East Coast of the United States could hold over 200 GW of offshore wind with current available technologies [2]. Regarding the West Coast, some limitations arise due to the greater depths close to shore. The same challenge is found in Japan and North Korea, for instance, where there are few shallow-water sites suitable for the industry.

It is in this context that floating foundations emerge as game changers [3]. This kind of foundation basically addresses two issues of huge importance. First of all, they allow the construction of power plants into deeper water depths (above 50 m). And, on the other hand, floating devices for offshore wind turbines have the potential to ease the turbine install, as well as bring improvements regarding the supply chain. [4] It is important to note that this feature of floating foundations, which allows construction at quayside and later towing, is of high importance because it allows a de-coupled supply chain from the geographic deployment area [5].

Principle Power Inc. is a vanguard company addressing this sector [6]. With the WindFloat as main product, the company aims for a cost-effective reliable solution for offshore wind foundations. The WindFloat is a semi-submersible floating wind foundation, based on a steel structure of three columns linked with truss structure, which allows access to deeper waters at lower costs. The wind turbine is erected in one of the three columns, which ensure stability through water entrapment platforms (WEPs). The WindFloat can be easily towed to site by regular tugs and thus avoid the rental of jack-up and crane vessels, which dramatically increase the cost of the projects.

As the most mature and cost efficient floating wind solution available in the market, the WindFloat is poised to reach commercial stage by 2020. After the success of WindFloat1, the 2 MW prototype that was operating in Portugal between 2011 and 2016, delivering a total of 17 GWh, Principle Power is determined to make the final arrangements for the future commissioning of the pre-commercial projects WindFloat Atlantic (WFA) and

WindFloat Mediterranean (WFM). Both of them seek to offer 24-25 MW, in case of WFA by installing three 8.33 MW Vestas units in north Portugal and in the case of WFM four 6 MW turbines, in the Gulf of Lion, in France.

In parallel to this, Principle Power is determined to pursue its target of making this technology available for commercialization and is working hard to find future suitable projects in new markets. In particular, the potential development of an offshore wind power plant of 500 MW in an area proposed by the authorities of Massachusetts will serve as a context to place these studies. As part of its main research essence, the document will use this particular case to narrow its scope and propose feasible logistical and cost solutions. The models used will have the finality of assessing the costs in terms of money and time that all these logistics will involve, all of it focusing on the commercialization of the product.

8. References

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