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 supporting a serialized fabrication of WindFloats. Moreover, this report studies the fabrication process and costs, and designs a suitable strategy for delivering WindFloats to a potential 500 MW project in Massachusetts, East Coast USA, . 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. This cost is significantly lower than the current cost for pre-commercial projects due to economies of scale effects. Further on, the report evaluates the final assembly process more thoroughly by estimating duration and labor requirements to execute the process. In order to deliver a unit every 3 days the research offers an explanation of the duration of operations and allocates the minimum necessary resources through a Gantt-based model, reaching a conclusion on the number of people to hire and the impact in the cost. To conclude, the study uses Principle Power's cost models to calculate LCOE for the 500 MW wind farm, considering a 25-year business case, and an 8.5% weighted average cost of capital.. The LCOE obtained is higher than the current values for European commercial projects due to the immaturity and lack of competition of the US market. If the WACC is reduced to current bid levels then the LCOE reaches really competitive levels.

Resumo

Com a tecnologia WindFloat, a Principle Power lidera o mercado das tecnologias flutuantes em energia *offshore.* A plataforma semi-submersível já demostrou as suas capacidades ao longo dos 5 anos que esteve a funcionar na costa norte de Portugal e agora a empresa enfrenta os próximos passos para comercializar a tecnologia nom horizonte mais vasto. Esta investigação analisa projetos futuros da empresa e tenta estabelecer os requisitos que as instalações portuárias têm que cumprir para serem capazes de suportar uma fabricação em série de WindFloats. Além disso, utilizando como contexto um potencial projeto de 500 MW na costa de Massachusetts, costa leste dos Estados Unidos, esta investigação analisa o processo e os custos de fabricação e desenha uma estratégia para satisfazer a produção e oferta da plataforma. Mediante a fabricação dos componentes básicos em Portugal e o seu envio para a costa leste dos Estados Unidos (Bridgeport, CT) para assemblagem final e ereção da turbina, o estudo prevê um custo da fabricação na ordem dos 7.31 M€/WindFloat. Este custo resulta consideravelmente menor do que o custo atual de fabricação. Por fim debruçamo-nos sobre o processo de montagem final (assemblagem) calculando tempo e custo do trabalho. Esta análise permite detalhar a duração das operações e a alocação de recursos, chegando a estimativas sobre o numero de pessoas a contratar e o seu impacto no custo, tudo isso para entregar uma unidade cada 3 dias. Finalmente a análise vai mais longe para mostrar o cálculo do LCOE (TRANSLATE BETWEEN BRACKETS), que resulta num custo de 113 €/MWh, tendo em consideração que a instalação eólica estaria a funcionar por 25 anos.

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Abbreviations

AEP	Annual Energy Production
ASM	A. Silva Matos, construction company
CAPEX	Capital Expenditure
COD	Commercial Operation Date
DEA	Drag Embedment Anchor
FID	Final Investment Decision
IAC	Inter Array Cable
LCOE	Levelized Cost Of Energy
MAWEA	Massachusetts Wind Energy Area
OPEX	Operational Expenditure
VLA	Vertically Loaded Anchor
WACC	Weighted Average Cost of Capital
WF	WindFloat
WF1	WindFloat 1, prototype in Portugal from 2011-2016
WFA	WindFloat Atlantic
WFM	WindFloat Mediterranean
WEP	Water Entrapment Plate
WTG	Wind Turbine Generator
WoW	Waiting on Weather

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