Driving Factors in the LCOE trend of offshore wind power

Presentation Living Lab Zephyros Bachelor thesis commissioned by the research group Delta Power

"The negative impact of an increasing distance to shore on the offshore wind energy sector"

H UNIVERSITY

OF APPLIED SCIENCES

Robin Maljaars 22th July,2021

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Introduction



Former Scalda Student Allround operational technician



Robin Maljaars

Living in Middelburg

23 Years old

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Former HZ University of Applied Sciences student Engineering-AOT



Bachelor Thesis commissioned by the Research group Delta Power



"What are the main techno-economic factors driving the LCOE of offshore wind?"



Data collection on 184 offshore wind farms within the UK,NL,BE,DE & DK



Results: Database with 22 different variables & Theory on development key-factors LCOE variable

Research Description





"A percental increase in production results in a fixed percentage improvement in production efficiency subsequently resulting in the reduction of production cost" – Theodore Wright, 1930



Output (University of Beltast, Letterkenny Institute of technology, 2020

* "The driving factors in the LCOE related to offshore wind energy can be divided into two categories"



"The key techno-economic driving factor in the LCOE trend of offshore wind is the distance to shore"

EU Wide Geographical Development



* "For every km increase in distance to shore the water depth on average increases with 2m"

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Correlation DtS & PS



* "Number of turbines increased from an average of 18 to an average of 60 per OWF"

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Correlation DtS & Number of turbines



"Number of turbines increased from an average of 18 to an average of 60 per OWF"

Correlation DtS & Individual CAPEX



* "The development of the total cost and project size is not linear due to technological developments"

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Correlation Turbine power size & Individual CAPEX

-Turbine power size Trendline Individual turbine CAPEX Trendline

* "The development of the total cost and project size is not linear due to technological developments"

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Correlation availability & DtS



* "Availability and the AEP trendlines both calculated and stated show an inversely related correlation"

Correlation AEP Trendlines & DtS



* "Availability and the AEP trendlines both calculated and stated show an inversely related correlation"

Conclusion



- €/MW Foundation capital cost increased with 33% as function of the water depth
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- function of the distance to shore €/MW Turbine capital cost increased with 38% as function of
 - the technological developments
 - Project expenses increased with 700%
 - Project revenues increased with 350%
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- Subpar development of AEP due to increasing wake losses and decreasing availability and accessibility
 - Increasing Distance to shore impacted risk assessments



UK political framework led to commissioning under high WACC

Looking ahead





- Distance to shore will keep on increasing
- Floating offshore wind will accommodate this development
 - Challenge: Similar CF and availability percentages \rightarrow 46% rise in LCOE between 2021 2035
- Solution: Joint maintenance & monitoring strategies that utilize clustering of OWF's
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- Solution: Technological and Logistical innovations
- Solution: A optimized and improved maintenance and monitoring approach
- Solution: An EU Wide lowering of the WACC with at least 3% is needed
- Preferably the market competitivity increases further
- Decommissioning and/or repowering as new challenges to the OWE sector

Thank you for your attention

Time for questions

Credits for visuals:

- Photosutat
- Highland news & Media
- Discovery UK
- "Recht door zee"

