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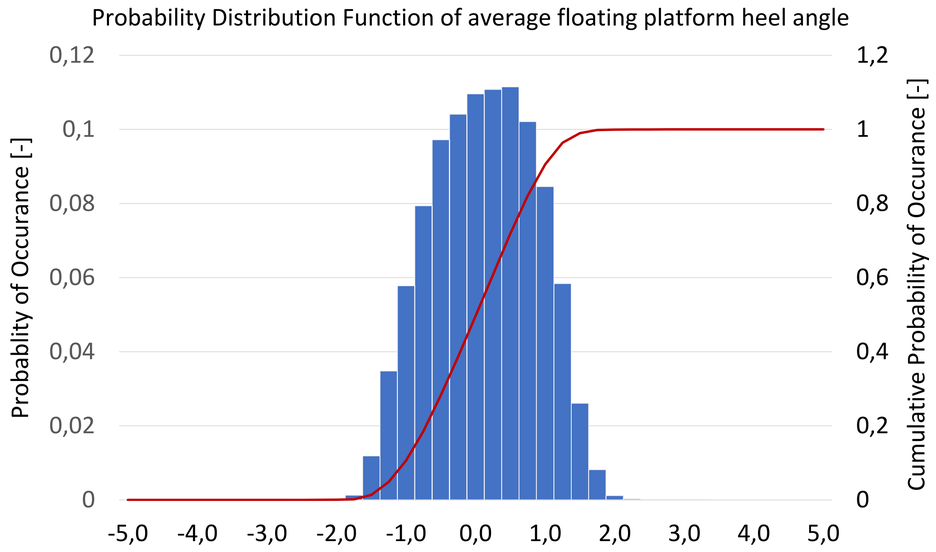
Developing the Next Generation 12+ MW Offshore Wind Turbine for Clean and Competitive Electricity

Maximized Annual Energy Production for Floating Wind Projects with Active Ballast System



Description: The active ballast system keeps the platform operating heel angle between -2.0 - +2.0 more than 98% of the time.

The active ballast system minimizes LCoE by maximizing AEP

To estimate the AEP of the floating case study, the project partners computed the heel angle probability distribution curve, considering heel corrections from the active ballast system of the platform – modeled in an in-house software developed by Principle Power.

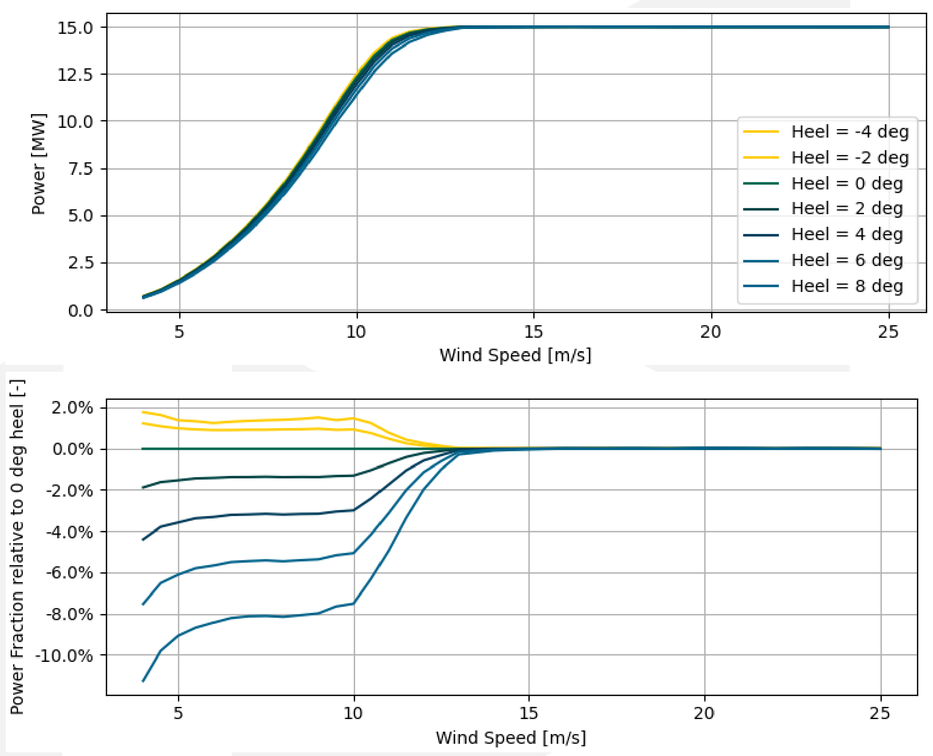
The analysis provided the following conclusions for a typical 15MW wind turbine:

- The active ballast system allows for a more aggressive Design Heel Angle, providing primary steel savings of approximately 10%.
- For a different range of project sites, the active ballast system is expected to increase gross AEP by 1.0%-2.5%.
- The additional CAPEX and OPEX required to procure and maintain the active ballast system are offset by the savings in steel and gains in AEP.
- The active ballast sytem impact on the LCoE is highly dependent on the project's revenue mechanism and the project's weighted average cost of capital.

Quantifying the impact of the Active Ballast System on the wind farm's Annual Energy Production

In Work Package 7 - "Exploitation of exogenous business and financing factors" – the project partners developed a probabilistic Levelized Cost of Energy (LCoE) model to support the identification of the main cost drivers of fixed and floating wind projects and evaluate the impact of different innovations. In the floating wind case study the floating platform was assumed to have an integrated active ballast system. The active ballast system transfers water between the platform column tanks to compensate for changes in the turbine thrust loads, maximizing the rotor swept area and consequently the Annual Energy Production (AEP). In addition, the active ballast system can be used to reduce fatigue loads of the WTG components and platform.

Principle Power – one of the project partners has a patented active ballast system that has been deployed in 8 platforms to date.



Note: A negative heel indicates 'upwind' while a positive heel refers to 'downwind'.

Description: Power curve of a 15+ MW floating wind turbine as a function of the platform heel angle.

Source

1. "Deliverable 7.3 Set up new consolidating financial model", Version 2.0 (2025): 36. (Confidential)

ReaLCoE's vision is to unleash the full potential of offshore wind energy
€35/MWh LCoE Goal, +12MW WEC Capacity, ~32 mio € Total Budget, 42 month project duration

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