EERA DeepWind CONFERENCE 2025

PROJECT INFO
We combined nacelle yaw and individual blade pitch controllers to mitigate the yaw drift of single-point moored floating wind turbines.

Integrated Control Strategy for Mitigating Yaw Drift in Single-Point Moored Floating Wind Turbines

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MOTIVATION

BRUNEL is a single-point moored semi-submersible wind turbine foundation designed by **Fred. Olsen 1848**. The floater obtained Basic Design Certification (TRL 6) by DNV in 2024.
Single-point moored floating wind turbines can benefit from the **self-alignment** of the structure with the prevailing wind direction. However, to be successful, the effects of **yaw-drift** caused by aerodynamic forces and platform motions must be mitigated using effective **control strategies.**

OBJECTIVES

The main objective of this project is to develop a controller to **vanish the yaw drift** of a single-point moored wind turbine in relation to the instantaneous wind. The outputs of the current project are to be applied to the **BRUNEL floater** being an enabler for better motion performance and reduced levelized cost of energy (LCOE).

METHODOLOGY

We compared controllers using:
- Saturated nacelle-yaw actuations;
- Individual pitch control (IPC) of the blades;
- A combination of saturated nacelle-yaw actuations and IPC with LIDAR measurements for feedforward contributions.

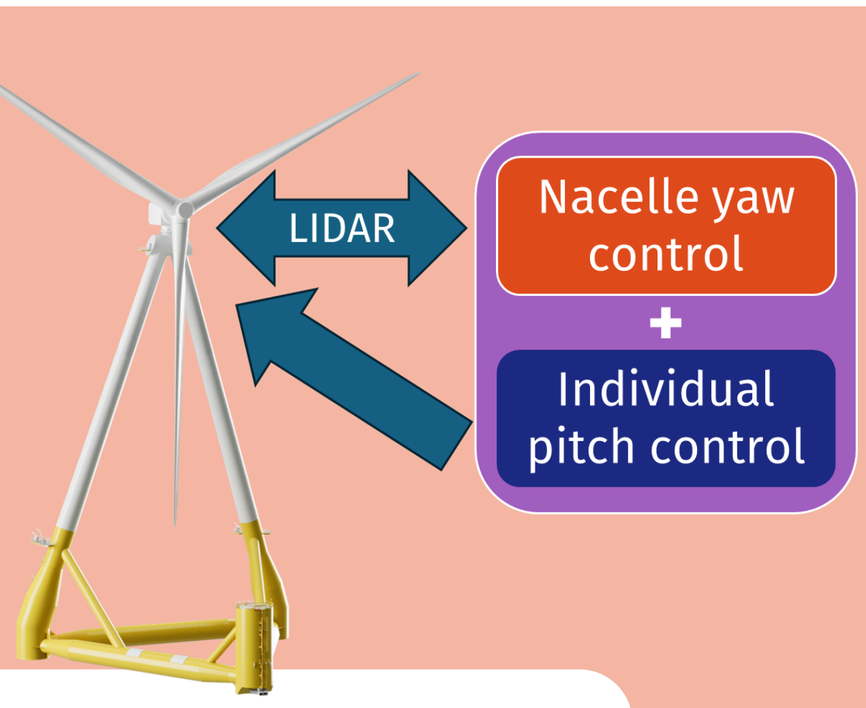
Aero-servo-hydro-elastic simulations of **BRUNEL** are performed using **3DFloat**.

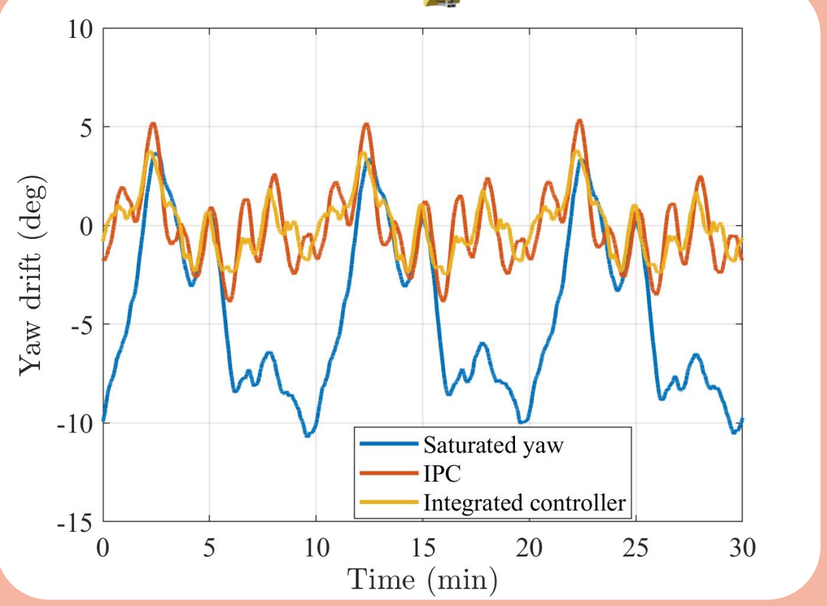
RESULTS

- **Improved alignment** between the rotor and the direction of the incoming wind;
- **Increased annual energy production**;
- **Fatigue reduction** in comparison to standard designs.

CONCLUSIONS

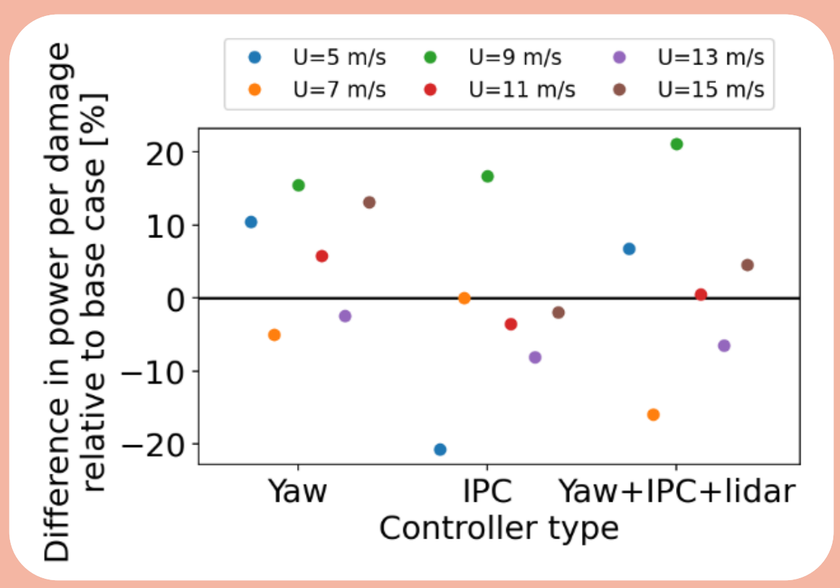
- The three compared approaches **reduce yaw drift** and increase power production;
- Yaw actuations alone result in **less fatigue** for the same power production;
- Implementing the control system in floating wind structures will reduce the LCOE.





Yaw drift (U=20 m/s, T_I=17%, H_S=6.5 m, T_P=12.6 s)

Power per damage (West of Barra site, T_I=17.6%)



Fred. Olsen 1848

Institute for Energy Technology