Wave Energy Converters shape optimisation: the influence of nonlinear hydrodynamic modelling

Thesis proposal at the Marine Offshore Renewable Energy Lab

Department of Mechanical and Aerospace Engineering, Politecnico di Torino

Recommended profile:
Mechanical engineering, Mechatronic engineering, Aerospace Engineering

Topics involved:
Mathematical modelling; Nonlinear hydrodynamic modelling; Wave energy conversion

Skills required or suggested:
Matlab; Simulink

Proposal description

Wave energy converters (WECs), are expected contribute to the clean energy transition. Shape optimisation is crucial to obtain an effective design The effectiveness of the optimisation depends on the fidelity of the numerical model; however, accurate numerical models are usually too slow to fit within an optimisation loop. In addition, it is important to include, to some extent, an energy-maximisation control strategy early in the design and optimisation stage.

This thesis aims to implement a computationally convenient numerical model, developed within an Horizon Europe Marie-Curie project and available in this toolbox, to study the impact of numerical model accuracy on shape optimisation. A simplified constrained energy-maximisation control strategy is embedded in the model. Firstly, a simple truncated cone is considered as archetypal shape; then, a more generic spline curve is considered as basis for the axysimmetric geometry of the WEC.

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