



Politecnico
di Torino



Wave Energy Converters systematic modelling for techno-economic performance assessment

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; Multi-body system dynamics; Wave energy conversion

Skills required or suggested:

Matlab; Simulink

Proposal description

Wave energy converters (WECs), are expected contribute to the clean energy transition. Due to the diversity of installation sites, sea state conditions, and user requirements, a wide variety of working principles exist. Therefore, it may be difficult to fairly compare different WECs. An additional challenge is the mathematical modelling approach, seldom standardized, and the choice of appropriate comparison metrics. The purpose of this thesis, related to a project funded by the European Commission, is to implement a portfolio of different and most recent/popular WECs, focusing on producing comparable results, informative for the decision-making process. The following highlights and steps are foreseen:

1. Use the new industrial-standard simulation tool called [WEC-Sim](#), considering 4 different WECs:
 - (a) Wave-Star: a starting point is openly available at this [link](#)
 - (b) Two-body self-referenced point absorber: a starting point is openly available at this [link](#)
 - (c) Oscillating Surge WEC: a starting point is openly available at this [link](#)
 - (d) Pendulum Wave Energy Converter (PeWEC): developed at Politecnico di Torino with ENEA
2. Improve WEC-Sim models with optimal control, based on [this](#) recent toolbox, and compare the resulting performance with more traditional control strategies.
3. Include a parametric description of costs, starting from [this paper](#), to reach a techno-economic description of the device, and potential alternative design reconfigurations.

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