

INTERACT – Simulation model for assessment of interaction effects between wave energy converters

Background and motivation

A few full-scale single-unit wave energy converter (WEC) prototypes have been deployed in the ocean. Further commercialisation requires installation of many WECs in array systems. The upscaling to array systems is a challenge due to interaction effects between WECs and their subcomponents. New design and assessment methods are needed which together with advanced simulation models can be used to design array farms accounting for interaction effects for optimum system performance e.g. power, fatigue life, levelised cost of energy (LCoE).



Objectives and goals of the project

The thesis project contributes to the development of such design methods and models. It is achieved by systems engineering, risk analyses and fully coupled hydrodynamic and structure response simulations. LCoE calculations will be used to show how the LCoE is affected by WEC interaction effects in wave farms including the structural integrity of moorings and cables. Show cases of (at least) two different WEC technologies, sites of operation and array systems will be simulated and analysed.

Methods and tools

The DNV-GL software SESAM will be used to model, simulate and analyze (at least) two WEC technologies. The fatigue assessment will be carried out using a procedure that has been developed in the research group on the division. There is a simulation model of one of the technologies that will be used in the project, but a new simulation model of at least one more technology must be developed.

LCoE calculations will be carried out according to a method proposed by Castro-Santos et al. (2016). Risk analysis will be carried out according to recommendations made by a classification society, likewise the environmental footprint.

The thesis should be written in Word using a template provided by the department.

The MSc thesis project should incorporate (at least) the following tasks:

- Literature study.
- Collection of Metocean data for candidates to installation sites that will be used in the numerical simulations.
- Use the existing simulation model of the Waves4Power technology and do the full analysis of this concept as a reference.
- Develop of a new simulation model (2-3 candidate technologies will be proposed), do the full analysis and compare with the reference technology.
- A selection of parametric studies that are relevant for the comparison of the two WEC technologies.
- Write a thesis report and present it on a public seminar.

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