MSc thesis project 2022 on the Division of Marine Technology,
Department of Mechanics and Maritime Sciences, Chalmers University of Technology

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

(Scientific fields: Naval architecture, Fluid dynamics, Renewable energy)

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. This thesis will study Novige's concept NoviOcean (see the figure) by doing simulations of different array configurations. The hydrodynamic performance and electricity production will be compared for a variety of installation and operation conditions, e.g., bathymetry, wave scatter diagram, and layout of the array farms.

Methods and tools

The DNV-GL software SESAM (weak nonlinear wave theory) and a CFD (nonlinear wave theory) software will be used to model and do the numerical simulations. The array farm layouts will be discussed with the company Novige. The simulations will be carried out in the frequency-domain. A wave-to-wire- model will be used and adapted to the results from the SESAM and CFD simulations.

The project should be carried out by two students working together.

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.
- Development of simulation models for the NoviOcean concept: in SESAM and in a CFD software.
- Frequency-domain simulations of several array farms.
- Wave-to-wire analyses.
- Parametric studies.
- Write a thesis report and present it on a public seminar.

Contact person (examiner and supervisor at Chalmers):
Associate Professor Huadong Yao (Huadong.Yao@chalmers.se)

Co-supervisor:
Professor Jonas Ringsberg (Jonas.Ringsberg@chalmers.se)
Xinyuan Shao (PhD student on the Division of Marine Technology)