

## PhD position on Hydrodynamic analysis and numerical modelling of heave-plates dedicated to the design of floating WT.

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**Location:** [LHEEA Lab](#) at Centrale Nantes (France)

**Supervisors:** Prof. David Le Touzé, Dr. Jean-Christophe Gilloteaux and Dr Benjamin Bouscasse.

**Expected starting date:** 1st of September or October 2020

**Contact details:** Interested candidates should submit a cover letter of interest, curriculum vitae to [jean-christophe.gilloteaux@ec-nantes.fr](mailto:jean-christophe.gilloteaux@ec-nantes.fr)

### Context

Centrale Nantes has a new PhD position available within the framework of the EU-funded [FLOAWER project](#). FLOAWER project main goal is to train 13 early stage researchers (ESRs) to design better performing, economically viable floating wind turbines.

Among these ESRs, Centrale Nantes has one about the hydrodynamic analysis and numerical modelling of heave-plates dedicated to the design of floating WT.

Heave plates are commonly used in floating wind energy for shifting the resonance periods of the platform out of the predominant wave periods and for damping the motion of the whole structure. During the design phases, heave plates are generally modelled in engineering design tools through Morison-type empirical formulations. These formulations are based on hydrodynamic coefficients that strongly depend on the flow properties (Keulegan–Carpenter number, Reynolds number) and are generally determined experimentally. Several hydrodynamic database are publically available that provides data for different shapes and flow properties but come from a literature dedicated to classical offshore engineering with structures relatively different to the ones developed in the FOW community (larger diameter of heave plates, larger amplitudes of motion, position wrt the free surface).

### Objectives

One of the objectives therefore lies in the implementation of a new methodology based on both CFD calculations and wave tank tests for obtaining a comprehensive hydrodynamic database dedicated to the floating wind community. Wave tank tests and simulations will be carried out for various geometry, column-diameter/heave-plate diameter ratio and heave-plate depth. Experimental tests will be conducted in ECN 3D-wave tank with realistic design and operation sea-states. The PhD student will participate to the design, setup, experimental campaign, and result analysis. Numerical tests will be conducted with an in-house variant of OpenFOAM dedicated to wave-structure interaction through the coupling with accurate deterministic wave evolution models. The PhD student will setup, run and analyze the different cases, including some specific numerical developments if needed.

A second objective will be the characterization of the validation domain of state-of-the-art engineering models for modelling heave-plates and their improvement through a model derived from the experimental and numerical study.

### Expected Results

- Hydrodynamic database for various geometries (column-diameter/heave-plate diameter ratio and heave-plate depth...)
- Improved numerical engineering models for modelling heave-plates.

### Planned secondment(s)

Secondments are planned for all ESRs of FLOAWER project. For the present PhD position, the student will have to spend 3 months during the first year at NTNU in Norway (supervisor Erin Bachynski), to learn on on the design and the experimental testing of heave-plates. At the end of the 2<sup>nd</sup> year, the student will spend 3 month at IDEOL in La Ciotat (supervisor Riccardo Mariani) to work on a study case on the modelling of heave-plates for barge-like foundation.

### Salary

The successful candidates will be employed on a **full-time basis** with a competitive salary in accordance with the MSCA rules and the personal circumstances of the applicant. The successful candidate will receive a financial package consisting of MSCA living allowance and mobility allowance. Eligible applicants with a family will also receive an additional family allowance according to the rules of the MSCA. The exact (net) salary will be confirmed upon appointment and will depend on a Host Institution's local tax regulations.

### Eligibility criteria

Applicants need to fully respect three eligibility criteria<sup>1</sup> (to be demonstrated in the CV):

1. At the time of commencing their FLOAWER employment, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their (recruiting) host organisation for more than 12 months in the 3 years immediately prior to their recruitment. Short stays, such as holidays, are not taken into account

2. Applicants must at the first day of their FLOAWER employment contract, **be in the first four years (full-time equivalent research experience) of their research career** and have not been awarded a doctoral degree. This research experience is measured **FROM** the date when they obtain the degree which formally entitles them to embark on a doctorate (either in the country in which the degree was obtained or in the country in which the researcher is recruited, even if a doctorate was never started or envisaged). Research Experience is measured **TO** the first day of the FLOAWER employment contract of the researcher.

3. English language proficiency: ESRs must demonstrate proficiency in both written and spoken English. This is mandatory for the ESRs to take full advantage of the training program.