
“18-month Post-doctoral position: Assessment of steep and breaking wave impact loads on floating offshore wind turbines by wave tank experiments”

O/Ref: FEM-SAS-2020-079

Company Description

FRANCE ENERGIES MARINES (FEM), is the French Institute for Energy Transition dedicated to Offshore Renewable Energy (ORE), supporting the nascent ORE industrial sector with the means and skills that increase competitiveness by mutualizing R&D costs, reducing risks and accelerating the acquisition of data and knowledge. FEM activities are founded on Research and Development projects and services. FEM collaborators are scientifically and technically involved in all activities thanks to their high level of scientific expertise. The headquarters of FEM are located in Plouzané (Brest area), France, along with additional offices in Marseille and Nantes. This allows FEM to be present on all oceanic façades and to build close relationships with most of the ORE value chain actors.

The association FEM was founded in 2012 while the recently created FEM joint stock company forms the basis of the newly labeled Institute for Energy Transition. The joint stock company is owned by 18 entities made up of private companies, ORE clusters, public bodies and local governments (Regions). This equilibrium between actors allows the institute to collaborate with a broad spectrum of experts and to prioritize development on challenges faced by the industrial sector as well as by concerned governmental agencies.

Position Description

The post-doctoral position is part of the DIMPACT R&D project dedicated to the “Design of FOWT (Floating Offshore Wind Turbine) and IMPACTs of energetic steep and breaking waves”. This project is coordinated by FEM. Within this project, the post-doctoral fellow will contribute to the development and performance of the wave tank experiments which will be conducted at IFREMER in Brest.

The objectives of this experimental task are:

1. to assess experimentally the water impact loads induced by steep and breaking waves on a floating wind turbine,
2. to relate the measured hydrodynamic loads to the incident wave field,
3. to assess the effect of the platform motion on the water impact loads,
4. to compare the measured loads with the results based on semi-analytical water impact models (e.g. Wagner theory or Pressure impulse theory) and with CFD approaches obtained in the other work packages of the DIMPACT project.

For this purpose, an instrumented scaled model of a spar-type FOWT will be designed, built and tested under different wave conditions representative of extreme steep and breaking waves. The motion of the floater will be emulated using a motion generator (hexapod) in order to control and vary the phasing between the motion and the waves. The hydrodynamic load distribution along the spar floater will be assessed using a segmented model and measuring the loads on each segment independently.

Missions

The missions of the post-doctoral fellow will be to:

- 1) design, follow the construction (by a sub-contractor) and test the model,
- 2) participate to the definition of the experimental conditions to be tested,
- 3) develop the experimental protocol and methodology,
- 4) analyze the results,
- 5) disseminate the results (write publications for research journals, participate to international conference).

Depending on the advancement of the project and remaining budget, complementary experiments with a transparent mock-up are likely to be initiated out in order to track the evolution of the wetted surface during an impact. This work would follow the developments carried out at Ifremer in the last years for the tracking of the wetted surface during water entry and water exit experiments. This method is based on the use of transparent mock-ups and a tangential LED lighting system (see Tassin et al., 2017 and Tassin et al., 2018). The post-doctoral fellow would be in charge of running preliminary experiments in order to show the feasibility of the technique for this particular application and to run the experiments in the wave tank.

FEM and IFREMER are looking for a highly motivated candidate eager to develop new experimental approaches and to interact with the other members of the consortium. The candidate will have the opportunity to work in a state-of-the-art facility comprising a deep water wave tank and a wave flume where two new state-of-the-art wave generators will be installed in autumn.

Supervision

The post-doctoral fellow will be employed by FEM, but will mainly work at IFREMER where the experiments will take place. Note that the offices of FEM and IFREMER are located on the same campus, at a walking distance. The post-doctoral fellow will be mainly supervised by:

- Alan Tassin, IFREMER, Research Scientist in Hydrodynamics, task leader of the wave tank experiments
- Jean-François Filipot: FEM Scientific and Technical Director, coordinator of the DIMPACT project

He/she will also interact with the other industrial and academic members of the consortium (e.g. EDF R&D, ENPC, ENSTA Bretagne).

Required Qualifications, Skills and Experience

Essential:

- PhD in mechanical or marine engineering, applied physics, or equivalent. Applications from applicants holding an MSc or MEng in a relevant field with appropriate experience might be considered,
- Strong experience in **hydrodynamics, free surface flows** and **water wave mechanics**,
- Expertise in the **design of experimental set-ups** (including sensor selection and mechanical design with CAD tools) for experiments in hydrodynamics,
- An expertise in nonlinear wave models would be appreciated,
- Programming experience (python, matlab, fortran, ...) for signal processing and analysis,
- Ability to write high level scientific reports and publications.

Desirable:

- Scientific rigor,
- Good ability to communicate in English.

Practical Information

Expected starting date: **September or October 2020**

Duration: 18 months contract

Employer: France Energies Marines

525 Av de Rochon

F-29280 Plouzané

The postdoc will spend about 80% of his time at IFREMER:

1625 Route de Sainte-Anne,

29280 Plouzané

FRANCE

Final date for applications: June 15, 2020.

In case of an expected secondment of the candidate by a member of France Energies Marines, the application should mention the agreement of the present employer.

Please send your CV and cover letter to the following email address: jean.francois.filipot@ite-fem.org and alan.tassin@ifremer.fr

References

Tassin, A., Breton, T., Forest, B., Ohana, J., Chalony, S., Le Roux, D., Tancray, A., 2017. Visualization of the contact line during the water exit of flat plates. *Experiments in Fluids* 58, 104.

Tassin A., Breton T., Jacques N., Etudes expérimentales et théoriques des phénomènes d'entrée et sortie d'eau, In Proc. 16th Journées de l'hydrodynamique (JH2018, November 27-29, Marseille, France), 12 pp.