

Topic: 8. Floating substructures, wind turbines and mooring systems

Title: Multidisciplinary and multiscale research activities on floating wind energy at the LHEEA Lab from Centrale Nantes

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Abstract: The presentation will cover the current research activities of the Laboratoire d'Hydrodynamique, d'Energétique et d'Environnement Atmosphérique (LHEEA) of Centrale Nantes on floating wind turbine (FOWT). The LHEEA is a joint research unit of the CNRS (UMR 6598) that has been working on Marine Renewable Energy systems since the 80s, for mechanical and/or energetic applications. The LHEEA has complementary tools and expertise (cf. Fig. 1) that allows us to support the development of floating wind turbines at the different stages of a concept design process. The LHEEA has an expertise in numerical modelling that is used for modeling environmental conditions and the behavior of structures at sea. The LHEEA also has experimental means (wave tank, boundary-layer wind tunnel) allowing testing and validating concepts at small to medium-scale. The LHEEA finally manages a sea test site for full scale testing of concepts or technological bricks.

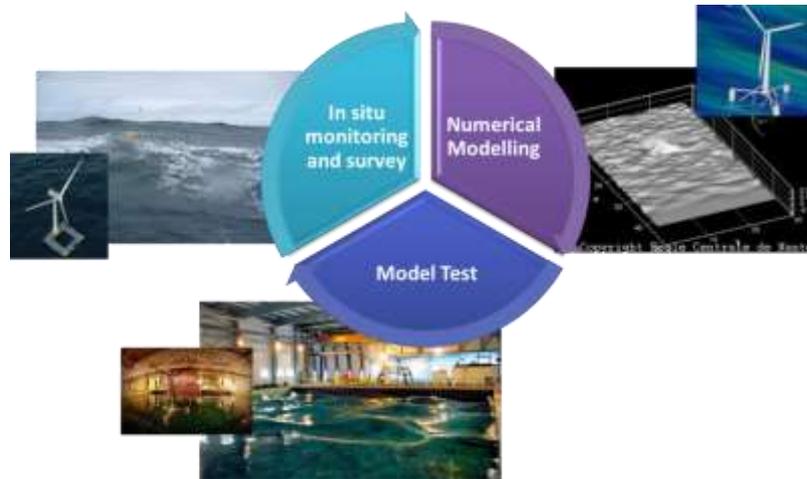


Figure 1: Centrale Nantes' strategy for supporting MRE development.

The presentation will focus on the projects that the LHEEA is currently undergoing with its recurrent industrial partners, as D-ICE Engineering and Innosea, promoting the need for integrated design, multidisciplinary approach and multiscale validation.

First projects about facilitating the maturation of FOWT and the optimization of the performances to reduce costs / risks will be presented. Hence projects that deal with the development of numerical tools (EOS, VAWT projects) dedicated to the simulation of single FOWT with different levels of accuracy will be presented. A focus will also be made on projects that deal with the design and the modelling of floating wind farm (FRyDom, Stationis, Ecosfarm). Status and preliminary results of the Softwind project about scale-model-testing of FOWT will also be presented. Projects (Powerflow, Floateole) about the influence of platform motions on the power curve assessment and wake properties, both based on Lidar measurements, will also be presented. The complementarity of these projects will be stressed with regards to design objectives and TRL needs.

The LHEEA is also involved in projects on the preparation of the next generation of offshore wind by exploring new concepts and technological breakthroughs. A project (WEREVER) on the preparation of the next generation of offshore wind energy conversion systems will be presented where preliminary results on the performance of an energy ship concept that would harness wind energy far offshore with an optimal routing strategy will be showed.