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Real-time hybrid testing of floating wind turbines

Scale model testing of offshore wind turbines suffers from a lack of appropriate facilities and scaling effects. The actual trend is to prematurely bypass this step by launching small or full scale prototype testing, with its considerable risk of failure and corresponding huge costs. Moreover, one may likely have the will to test only one aspect of such a system among many (aerodynamics, hydrodynamics, control, structural dynamics, power generation…).

From these considerations comes the idea of real-time hybrid testing, consisting in testing physically only one part of the total loading. The remainder is simulated numerically, in order to be actuated back in real-time on the physical model by mean of actuators.

The Phd topic consists in investigating the applicability of real-time hybrid testing to hydrodynamics, through the relevant case of floating wind turbines. Suitable numerical models are first to be created/adapted to calculate loads in real time from measured motions. These loads are sent as a reference to a controller driving actuators whose dynamics are crucial regarding the final performance and need to be studied thoroughly. Comparing the results of this method with advanced numerical models and model and/or full scale testing would give an assessment on its applicability.