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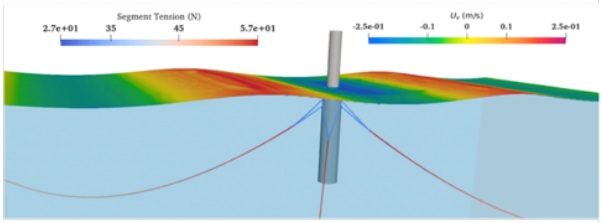

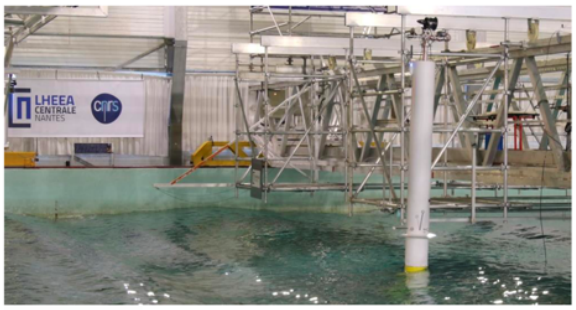

INVESTIGATION OF DYNAMICS OF HEAVE PLATES FOR FLOATING OFFSHORE WIND TURBINES

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Abstract

Floating offshore wind turbines, supported by semi-submersible or spar foundations, often include heave plates for improving the dynamics of the structure. This is achieved by increasing the inertial effects (or added mass) and the damping coefficient. Several studies have been performed with both numerical, and experimental approaches. Most literature provides semi-empirical relations for the hydrodynamic coefficients dependence on the amplitude and regime of the oscillations, quantified by non-dimensional parameters as the Keulegan-Carpenter number (KC) and frequency parameter (β) respectively [1]. Moreover, some other geometrical parameters can also influence the hydrodynamic behavior. Porosity, thickness, edge shape plate shape and separation are among the most researched parameters [7].

That said, there remains many unknowns when it comes to the flow structures responsible for energy dissipation. Some shedding regimes have been studied but for low KC numbers and in conditions far from the surface. Additionally, the inclusion of the influence of a free surface with waves and currents, which is even more relevant for floating wind structures. Although, there have been some studies where the seabed and free surface conditions have been explored [2, 4, 5], they have mostly been performed on still water conditions, and not under sea conditions. At the same time, the inclusion of waves and currents, can alter the hydrodynamic performance of the plates [3, 6].

In this experimental study, a 2D plate set in a canal at LHSV is proposed to investigate the hydrodynamic response of the plate as shown in Fig. 1. First, the experiment will be conducted in still water conditions with forced motion of the actuator. The coefficients will be obtained from force and displacement measurements and then, a PIV analysis will be conducted to analyze the vortex generation and shedding pattern. This will allow us to characterize the energy dissipation mechanisms far from the free surface and close to it. Finally, the effects of current can also be included within the LHSV canal in future tests.

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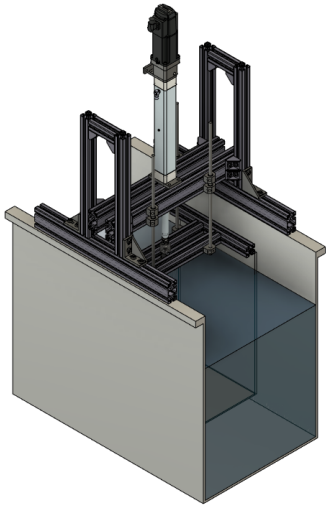

FIGURE 1 – 3D schematic view of floater installation.

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