FLOATECH

D4.2. Initial Design Report: Teeter Hinge, Compliant Turbine Floater and Controllers

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FLOATECH
THE FUTURE OF FLOATING WIND TURBINES

PUBLISHABLE SUMMARY

This work constitutes deliverable 4.2 of the FLOATECH project, funded under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101007142. Wind farms can produce significantly more energy when the negative effects of the turbine-to-turbine interaction can be mitigated. Several promising solutions that have gained traction in literature are so-called wake mixing techniques. This technique uses the blade pitch degree of freedom to destabilize the wake, promoting the re-energization process in the wake. Re-energization of the wake increases the wind speed downstream, resulting in higher power production for any downwind turbines.

Work Package 4 investigates how these wake mixing techniques and floater design can be synergized to achieve an overall higher level of either wake mixing or reduction in turbine-to-turbine interaction. Deliverable 4.1 of this work package investigated the working principle behind wake mixing techniques and looked into how wake mixing techniques work on floating turbines. This deliverable explains the tools that will be used in the project to optimize floater design and wake mixing techniques. It will also introduce the principle of a teetered wind turbine and explore, on a conceptual level, its potential use for wake mixing purposes on floating turbines

The optimization method described in this deliverable is capable of optimizing platform geometry with the goal to promote platform motion. The optimization technique is capable of promoting the yaw motion of a triple spar platform, excited by the Helix wake mixing technique. At the same time, the optimization technique also accounts for structural and cost-related constraints. The desired platform motion is based on eigenfrequencies that can be excited using wake mixing techniques. Especially the OC4 [13] platform has an eigenfrequency in yaw motion at typical excitation frequencies used for wake mixing purposes. The work presented in this deliverable serves as the basis for the continuation of Work Package 4, specifically deliverable 4.3. In that deliverable, both wake mixing controller and optimization method will be merged.