The 5 MW DeepWind floating offshore vertical wind turbine concept design - status and perspective - DTU Orbit (16/01/2019)

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Floating vertical-axis wind turbines for offshore wind energy present a concept with novelty and potentials for reducing COE. Cost reduction for offshore wind power plants is an industrial challenge, and DeepWind is - as the analysis of the current design shows-believed to be a good candidate in achieving this.

In the paper the current design status of the 5 MW DeepWind concept is presented. The intended siting for the turbine is off the Norwegian west coast at about 250 m of sea depth. Focus is set on the integrated design highlighting structural benefits of the light rotor, the hydrodynamic aspects of the floating hull, and new generator design embracing magnetic bearings.

Two important design tools were developed which allow the industry to analyze various VAWT (vertical Axis Wind Turbine) variants for offshore applications: a main design tool "HAWC2" for aerelastic design of VAWTs, and a generator design tool "NESSI". HAWC2 has been adopted for VAWT rotors by DTU Wind Energy in the project and is explained on its technical capability to embrace integrated modeling of the different physical aspects. NESSI, developed at AAU (Aalborg University) is presented with focus on key elements in generator design.

The paper presents new developments in the current design of a novel rotor shape with overspeed control. Rotor performance, design structural key figures and upscaling potential are reported. New results implemented on permanent magnets generator and - bearing technology show, that it is possible to achieve a competitive design ready for further industrial optimization. A preliminary analysis is provided on the emergency philosophy for this concept.