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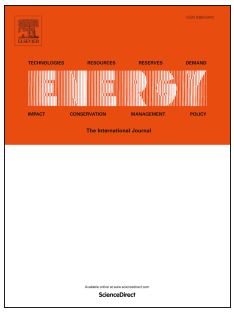

Study of the unsteady aerodynamics of floating wind turbines

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Study of the unsteady aerodynamics of floating wind turbines

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Abstract: The aerodynamic performance and instabilities of floating platform wind turbines are much more complex than fixed based wind turbines because of the flexibility of the floating platform. Due to the extra six degree-of-freedom of the floating platform, the inflow of the wind turbine rotors is highly influenced by the motions of the floating platform. In the present study, an unsteady lifting surface method with a free wake model is developed for the analysis of the wind turbine unsteady performance under the floating platform surge motion conditions. The full scale NREL 5 MW floating wind turbine is chosen as the subject of the present study. The unsteady aerodynamic performance and instabilities have been discussed in detailed. It is believed that under certain platform surge motion, the wind turbine may gain more aerodynamic power output than under steady state condition. The flow separation on the surface of the blade and the pitch control may have the potential of leading the floating wind turbine into unstable conditions during certain platform surge motion.

1. Introduction

Deep sea offshore wind energy has potential advantages[1-3] compared with onshore wind energy for the following reasons: 1. The sea surface is much smoother

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