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EXECUTIVE SUMMARY

Energy security is an important part of any developing country to ensure sustainability and economic growth. The vision of the Ministry of Energy and Natural Resources Malaysia is to be at the forefront of sustainable electricity technology, to ensure reliable, affordable and sustainable electricity supply to the people. Recent studies suggest that Malaysia has tidal energy potentials of over 8 TWh per year. Therefore, it will be beneficial to conduct further studies to utilize this energy potential. A rigid surface boundary is often adopted for floating tidal turbine studies due to the assumption that the free surface deformation has minimal impact on the turbine's performance. Therefore, the present study aims to determine the effect of free surface deformation on the floating tidal turbine. Understanding the effect of waves on floating tidal turbines is still in its infancy due to the lack of available literature. Therefore, it is crucial to investigate the effects of waves on floating tidal turbines' performance to optimize the design of the device. It is important to analyze the wake behaviour of a floating tidal turbine under waves condition since the wake-induced loading can give a significant contribution to the fatigue loading on the rotor. The proposed study will use an actuator disk model to simulate the floating tidal turbine oscillating in one degree of freedom (i.e., the pitch motion), operating under free surface deformation conditions, and combined waves-current conditions. Computational simulations will be conducted in OpenFOAM using a new proposed solver. The research output will be used for future prototype development, which includes the understanding of unsteady loading on a floating tidal turbine undergoing the pitch motion operating under free surface deformation conditions, and the combined wave-current conditions. The research output can be beneficial in optimizing the design of floating tidal turbines.