Title of Diploma Thesis

Time-Domain Investigation of the Performance of a Floating Wave Energy Converter

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ABSTRACT

The need for alternative energy sources in order to cover the growing demand has led to the utilization of renewable energy sources, which include wave energy. In the context of the present study a time-domain investigation of the performance of a floating wave energy converter (floating two-body heaving converter or F-2HB) is conducted aiming at the assessment of its hydrodynamic behavior and its power production under various wave conditions.

Firstly, the numerical methods employed for the calculation of the parameters needed for the analysis of the floating bodies' response under the effect of waves are presented. The presentation is focused on the Wave Energy Converter-Simulation Tool (WEC-Sim), which is the numerical tool used in the present thesis.

Next, the geometric characteristics of the examined wave energy converter (F-2HB) are presented along with its function. In addition, the methodology followed for modeling the examined F-2HB in WEC-Sim is presented.

Further up, the investigation is focused on the results related to: (a) the selection of the optimal damping coefficient of the Power Take-Off (PTO) mechanism for maximizing the power production of the system and (b) the system's response under the effect of regular and irregular (wave spectra) waves.

Finally, the estimation of the energy production of the examined wave energy converter under various wave conditions is obtained; this estimation corresponds to a quantitative approach on the issue of wave energy harvesting.

Keywords: Wave energy, Numerical modeling, Wave energy converter, Floating two-body heaving converter, Response. Energy production, PTO damping coefficient.