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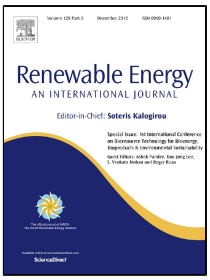

Power performance of BBDB OWC wave energy converters

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Power performance of BBDB OWC wave energy converters

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Abstract

This research presents the power performance of the backward-bent duct buoy (BBDB) oscillating water column (OWC) wave energy converters (WECs). To achieve that, following steps are detailed: firstly, power conversion from wave power into pneumatic power by coupling the hydrodynamics and the thermodynamics in the air chamber using a linear air turbine power take-off (PTO), with the calculation of the power response curves for the BBDB OWC device in regular waves; secondly, using the power response curve, a power performance curve is then calculated for irregular waves; thirdly, the power matrices for the device is calculated and the determination of the rated power for the device to meet the target capture factor; and finally, the annual energy production will be assessed as the final indicator for the device's power performance.

Using the developed approach, some initial optimisations are made to the original design. It is shown that with some simple optimisations, the BBDB OWC device could increase the annual energy production (AEP) significantly. A simple change in making a uniformed water column for the RM6 device could increase the AEP by about 10%, whilst increasing the horizontal duct length by 10m could increase the AEP by 58%.

Keywords: Wave energy conversion; Oscillating Water Column; backward bent duct buoy (BBDB); power performance; power matrix; annual energy production

1 INTRODUCTION

Following the research on the hydrodynamic performance of the BBDB OWC wave energy converters, this research focuses on the power conversion, power performance and energy production of the device for extracting energy from waves. This is done with the formulations for the power conversion train from waves to energy production. Firstly, based on the hydrodynamics study in the previous part of the research, the