Wave Efficiency Converter Efficiency Enhancer: Adaptations to the Pelamis Device

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Wave energy, an up-and-coming, field in the area of sustainable resources, harnesses the movement of waves in order to generate usable energy. one of the main problems, as for most types of renewable energy, is efficiency, and is what this project seeks to improve. The Pelamis Wave Energy Converter (WEC) device is a line-attenuator, chosen as it is one of the few WEC devices close to commercial operation. It consists of five hollow steel segments, each connected by a universal joint to the next, allowing for two degree of freedom movement. The motion of the segments drives hydraulic rams which generate electrical energy, This project aims to maximize the power output of the Pelamis device by adjusting the length of the segments according to wave conditions. A relationship between wave conditions and the optimal length of a segment, was found and used to construct a power matrix illustrating the projected power output for different wave conditions. The power matrix was applied to 2012 buoy data using MATLAB, allowing for calculation of the mean estimated power output of the modified device. The power matrix for the original device was also applied to the buoy data, and the mean estimated power in the same wave conditions was calculated. Comparison of the results revealed a significant increase in projected power output when the device was adjusted to wave conditions. Thus, according to our projections, the modification ot the Pelamis device would significantly increase the efficiency and power output of the wave energy converter.

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