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A comparison of control strategies for wave energy converters

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Abstract

In this study, we employ a numerical model to compare the performance of a number of wave energy converter control strategies. The controllers selected for evaluation span a wide range in their requirements for implementation. Each control strategy is evaluated using a single numerical model with a set of sea states to represent a deployment site off the coast of Newport, OR. A number of metrics, ranging from power absorption to kinematics, are employed to provide a comparison of each control strategy's performance that accounts for both relative benefits and costs. The results show a wide range of performances from the different controllers and highlight the need for a holistic design approach which considers control design as a parallel component within the larger process WEC design.

Keywords: wave energy, control, dynamics

1. Introduction

2 The energy contained in ocean waves is distributed across a wide range of frequen-
3 cies. In order to produce electricity efficiently, wave energy converters (WECs) must
4 be designed to capture a large share of the energy from a broad range of ocean wave
5 frequencies. Additionally, the majority of energy in ocean waves exists at relatively low
6 frequencies, which are most easily accessed by relatively large WECs. To limit the size,
7 and therefore cost, of a WEC and to increase energy absorption over a broad range of
8 frequencies, an increasing body of research has shown power take-off (PTO) control to
9 be an attractive path.

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