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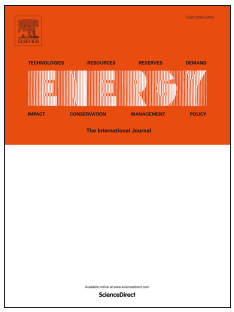

Wave energy farm design in real wave climates: The Italian offshore

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Wave energy farm design in real wave climates: the Italian offshore

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Abstract:

The work focuses on hydrodynamic interactions between heaving wave energy converters (WEC). Wave parks of four devices are simulated in the time domain by a hydrodynamic-electromagnetic model, coupled with a boundary element code for the estimation of hydrodynamic parameters. Different layouts (linear, square and rhombus), WEC separation distances (5, 10, 20 and 30 buoy diameters) and incident wave directions (30° apart) are considered to assess the effect of design parameters on array power production. Then, a site-specific design optimization is carried out for different Italian locations and some key insights on wave farm design in real wave climates are provided. The results show that the effect of wave interactions on energy absorption is not expected to be a main issue, as long as the devices are separated by at least 10 buoy diameters and that the layouts are oriented to achieve the maximum energy absorption for the prevailing wave direction.

Keywords: renewable energy; wave energy; arrays; hydrodynamic interactions; numerical modelling; Italy.

1. Introduction

Since the renewed interest in wave energy conversion, following the 1973 oil crisis, significant advances have been made in modelling, design and optimization of wave energy converters. Wave to wire models coupled with boundary element methods (BEMs) for estimation of hydrodynamic parameters are now the state of the art and are currently used by WEC developers to assess device