

Power Production Performance of Different Wave Energy Converters in the Southwestern Black Sea

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Abstract : This study aims to investigate the amount of energy (economic wave energy potential) that can be obtained from the existing wave energy converters in the high wave energy potential region of the Black Sea in terms of wave energy potential and their performance at different depths in the region. The data needed for this purpose were obtained using the calibrated nested layered SWAN wave modeling program version 41.01AB, which was forced with Climate Forecast System Reanalysis (CFSR) winds from 1979 to 2009. The wave dataset at a time interval of 2 hours was accumulated for a sub-grid domain for around Karaburun beach in Arnavutkoy, a district of Istanbul city. The annual sea state characteristic matrices for the five different depths along with a vertical line to the coastline were calculated for 31 years. According to the power matrices of different wave energy converter systems and characteristic matrices for each possible installation depth, the probability distribution tables of the specified mean wave period or wave energy period and significant wave height were calculated. Then, by using the relationship between these distribution tables, according to the present wave climate, the energy that the wave energy converter systems at each depth can produce was determined. Thus, the economically feasible potential of the relevant coastal zone was revealed, and the effect of different depths on energy converter systems is presented. The Oceanic at 50, 75 and 100 m depths and Oyster at 5 and 25 m depths presents the best performance. In the 31-year long period 1998 the most and 1989 is the least dynamic year.

Keywords : annual power production, Black Sea, efficiency, power production performance, wave energy converter

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