

## Near Shore Wave Manipulation for Electricity Generation

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**Abstract :** The sea waves carry thousands of GWs of power globally. Although there are a number of different approaches to harness offshore energy, they are likely to be expensive, practically challenging and vulnerable to storms. Therefore, this paper considers using the near shore waves for generating mechanical and electrical power. It introduces two new approaches, the wave manipulation and using a variable duct turbine, for intercepting very wide wave fronts and coping with the fluctuations of the wave height and the sea level, respectively. The first approach effectively allows capturing much more energy yet with a much narrower turbine rotor. The second approach allows using a rotor with a smaller radius but captures energy of higher wave fronts at higher sea levels yet preventing it from totally submerging. To illustrate the effectiveness of the approach, the paper contains a description and the simulation results of a scale model of a wave manipulator. Then, it includes the results of testing a physical model of the manipulator and a single duct, axial flow turbine, in a wave flume in the laboratory. The paper also includes comparisons of theoretical predictions, simulation results and wave flume tests with respect to the incident energy, loss in wave manipulation, minimal loss, brake torque and the angular velocity.

**Keywords :** near-shore sea waves, renewable energy, wave energy conversion, wave manipulation

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