

Co-ordinated Control in Arrays

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Introduction

This project, which is a part of the Workstream 7 of the SuperGen Marine (phase two), aims at developing the model of an array of wave energy converters (WECs) described in [1]. This is done with the goal of analysing the effects of the wave farm on the weak rural electrical network to which it is connected. The project will explore whether co-ordinated control of multiple WECs would augment energy yield and improve network integration capabilities.

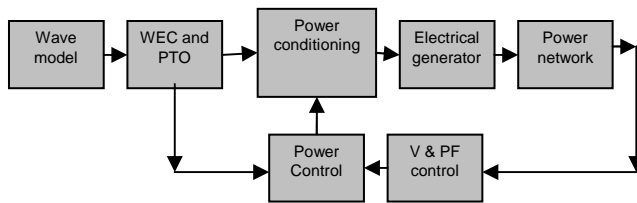


Fig 1. Schematic of a WEC connected to the electric grid [1],[2]

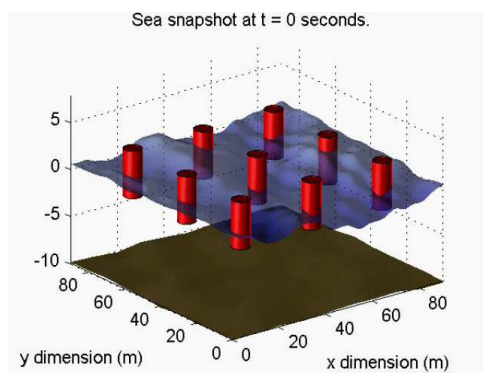


Fig 2. WECs in a wave farm [2]

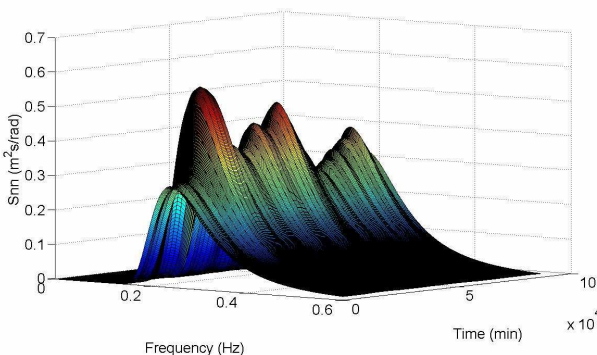


Fig 3. A directional, non-stationary wave spectrum

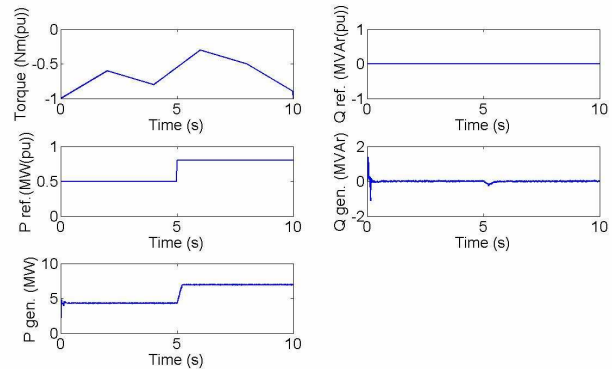


Fig 4. Reactive and active power control of Doubly Fed Induction Generators (DFIGs)

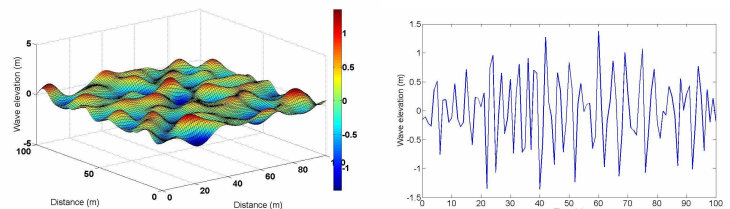


Fig 5. Wave field in a 100m x 100m area; Wave elevation time series

Objectives

1. Advance the ocean wave model to include the effects of non-linearity.
2. Incorporate the effects of device-device interactions within the model.
3. Develop a generic model of the power smoothing and conditioning block shown in figure 1.
4. Study the impact of connecting an array of WECs to a weak, rural power grid.
5. Examine the effects of co-ordinated control of WECs in an array on energy yield and network integration capabilities.

References

1. Kiprakis, A.E, and Wallace, A.R (2008) "Time Domain Modelling of Wave Energy Converter Arrays in 3-Dimensional, Non-Stationary Seas", Proc. 1st UKERC SuperGen Conference, Oxford.
2. Kiprakis, A.E. and Wallace, A.R. (2005). "Power Control and Conditioning for Wave Energy Converters", Proc 6th European Wave and Tidal Energy Conference, Glasgow.