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Published in:
The 8th European Wave and Tidal Conference : EWTEC 2009

Publication date:
2009

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Beels, C., Troch, P., De Visch, K., De Backer, G., De Rouck, J., & Kofoed, J. P. (2009). Numerical Simulation of Wake Effects in the Lee of a Farm of Wave Dragon Wave Energy Converters. In *The 8th European Wave and Tidal Conference : EWTEC 2009: Book of Abstracts* (pp. 62)

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Numerical simulation of wake effects in the lee of a farm of Wave Dragon wave energy converters

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Session XII (poster session), Tuesday 16.30–18.30, Main hall

The contribution of wave energy to the renewable energy supply is rising. To extract a considerable amount of wave power, Wave Energy Converters (WECs) are arranged in several rows or in a 'farm'. The wake behind each individual WEC in the farm affects the power absorption of its neighbouring WECs.

In this paper wake effects in the lee of a single Wave Dragon WEC and multiple Wave Dragon WECs are studied in a time-dependent mild-slope equation model. The Wave Dragon WEC is a floating offshore converter of the overtopping type. The water volume of overtopped waves is first captured in a basin above mean sea level and then drains back to the sea through hydro turbines.

The wake dimensions behind a single Wave Dragon WEC are investigated for uni- and multidirectional waves. An increasing directional spreading results in a faster wave redistribution behind the WEC. The power absorption of a farm of five Wave Dragon WECs, installed in a staggered grid, is calculated for varying in-between distances. It is observed that an in-between distance of $2D$ is preferred, when taking spatial and safety considerations into account.

Keywords: farm, mild-slope equation, wake, wave energy