



## CEFLOW PROJECT

The CEFOW (Clean Energy from Ocean Waves) project aims to deploy an array of three Wello Penguin wave energy converters (WECs) with improved power generation capability. The project will demonstrate that the WECs can survive in challenging sea conditions over a period of several years.

In addition, a cost reduction roadmap will be developed to bring the levelised cost of wave power closer to a commercially viable level in the near future.

The Penguin array will be installed at the European Marine Energy Centre (EMEC)'s wave energy test site on the west coast of the Orkney Islands, where all required infrastructure, including grid connection, are already in place.

CEFLOW will be the first project in the UK to grid connect an array of wave devices.

The five year demonstration project will offer unique and valuable information about the composition and survivability of different components in a wave energy project, and on the costs associated with long-term marine operations, component development, and decommissioning.

## CEFLOW AIM

The CEFOW project aims to demonstrate advanced ocean WEC technology to increase the speed of wave power development and decrease the levelised cost of ocean energy by 30%.

## CEFLOW OBJECTIVES:

- Improve the availability and performance of Wello's Penguin WEC;
- Tailor the solution with low life-cycle cost in mind for long term deployment;
- Create a cost efficient supply chain to support larger wave energy projects in the future;
- Generate an improved understanding of the relationship between multiple WEC installations and the host environment.



“Deploying Wello’s Penguin WEC in winter has been an important milestone, proving that operations can be done safely outside the summer season if needed.”

“We are delighted that the device is now generating power and has been operating safely on site since it was installed.”

**MIKKO MUONIOVAARA**  
**FORTUM**

## CEFOW CONSORTIUM

The CEFOW consortium spans the full value chain including research organisations, wave energy technology developers, marine service providers and a large multi-national utility company.

### Partners:

- Fortum (lead partner)
- Wello
- Green Marine
- Uppsala University
- Plymouth University
- University of Exeter
- EMEC



## TESTING AND DEMONSTRATION

Wello’s Penguin was installed at the beginning of March 2017 by Orkney-based Green Marine.

The device successfully generated electricity into the national grid in April 2017, and has been continuously operating safely on site since then, surviving wave heights of 18m.

This is the first of three Penguin WECs due to be installed at EMEC over the next two years. WEC2 is currently being manufactured in Tallinn, Estonia.

## ECOLOGICAL STUDIES

Exeter, Plymouth and Uppsala universities are conducting ecological studies over a three-year period to determine how the Penguin interacts with the marine environment.

The first two years of studies have been completed over summer in 2017 and 2018, with initial observations indicating the presence of a variety of species and habitats.



UPPSALA  
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