

# Decommissioning Penguin WEC 1 and Mooring Components

## Project Information Summary

February 2020



## Document History

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1.0	27/02/20	Originate	EMEC (CL)		Fortum (MM)

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## Executive Summary

Through the Horizon 2020 Clean Energy from Ocean Waves (CEFOW) project, Wello developed the Penguin device and successfully installed the wave energy converter at the European Marine Energy Centre (EMEC) in 2017. The device underwent a successful testing campaign and remained on site for over two years. In March 2019, the device's integrity was undermined the device began to take on water. The floating device sunk to the seabed where it has been regular monitored, when weather and sea conditions have allowed. This document has been produced has a project summary to support a marine licence application in order to remove the device from the seabed and return to shore. The work is anticipated to take place during summer 2020. The removal work is currently being tendering through a rigorous procurement process and a marine contractor is expected to be selected shortly. Once the contractor has been selected further details regarding the removal method and vessel spread will be available. A high-level method statement has been produced as an accompanying document to this project summary.

As lead partner to the CEFOW project, Fortum Energy UK is completing the removal work.

## 1 Introduction

This document has been developed as project summary regarding upcoming, proposed removal work at the European Marine Energy Centre's Billia Croo test site. The proposed removal work comprises the removal of a wave energy device and associated moorings from the seabed, following the device taking on water in March 2019. The work is being completed by Fortum Energy UK, and involves the removal of a Penguin device, technology developed Wello under a European Commission Horizon 2020 project, Clean Energy From Ocean Waves (CEFOW) project.

## 2 Project Team

Fortum Energy Ltd (Fortum) are a large multinational utility company and will be ultimately responsible for ensuring Penguin 1 is removed from site. Orcades Marine Management (Orcades) have been contracted to support the operational management of the work on behalf of Fortum.

The European Marine Energy Centre (EMEC) is the owner and operator of test site in which the device is currently located. EMEC will assist Fortum in performing their responsibilities.

## 3 Schedule

The schedule for the decommissioning works is shown in the following table. The works are anticipated to occur between May 2020 and September 2020. However, to allow some redundancy in the schedule, the marine licence application will cover the period until 1<sup>st</sup> March 2021. Thereafter, all devices will be completely removed from the site.

At all times, works onsite will be subject to EMEC's Permit to Work system, which is managed by EMEC to ensure that all activities and operations undertaken on EMEC test site are conducted using safe systems of work which comply with relevant health and safety legislation and are, so far as reasonably practicable, safe and without risk to health, safety or the environment.

	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21
Removal work											
Redundancy											

## 4 Location

The Penguin device is currently located within EMEC's Billia Croo test site at test berth 5, see following figure.

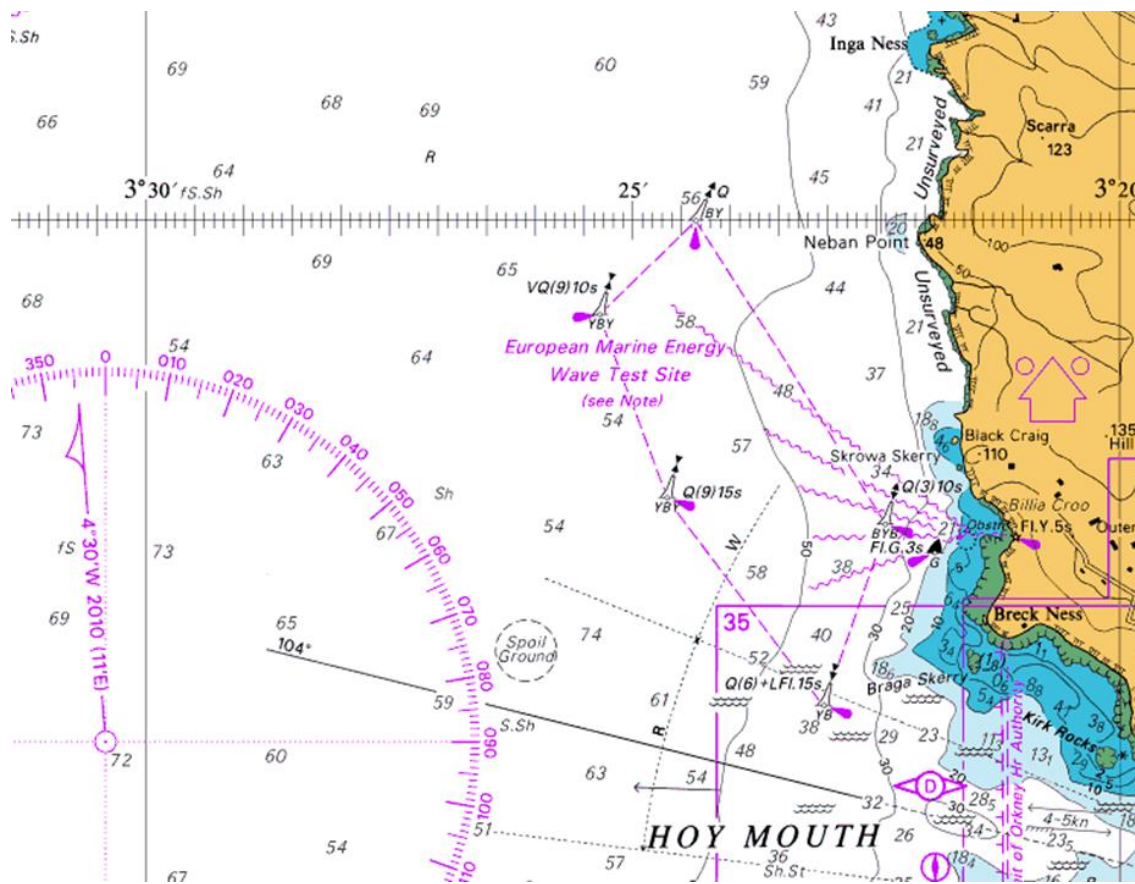


Figure 1. Part of Admiralty Chart 2249 showing Billia Croo test site

Test berth 5 is located in the north of site and has water depths ranging from 50-70m. The licence boundary required for the removal work is provided in the following table. Further details regarding the current device and mooring location are provided in the method statement, these are within the proposed licence boundary.

During the removal work, it is proposed that transport audit reports (TARs) will be submitted on a monthly basis. The TARs will include information on the nature and quantity of objects removed.

Table 1. Coordinates of licence boundary

Point	Latitude	Longitude
NW	58° 59.46'N	003° 25.32'W
N	59° 00.00'N	003° 24.36'W
NE	58° 59.46'N	003° 23.70'W
E	58° 59.16'N	003° 24.24'W
SE	58° 59.10'N	003° 24.60'W
S	58° 59.10'N	003° 25.08'W
SW	58° 59.46'N	003° 25.32'W

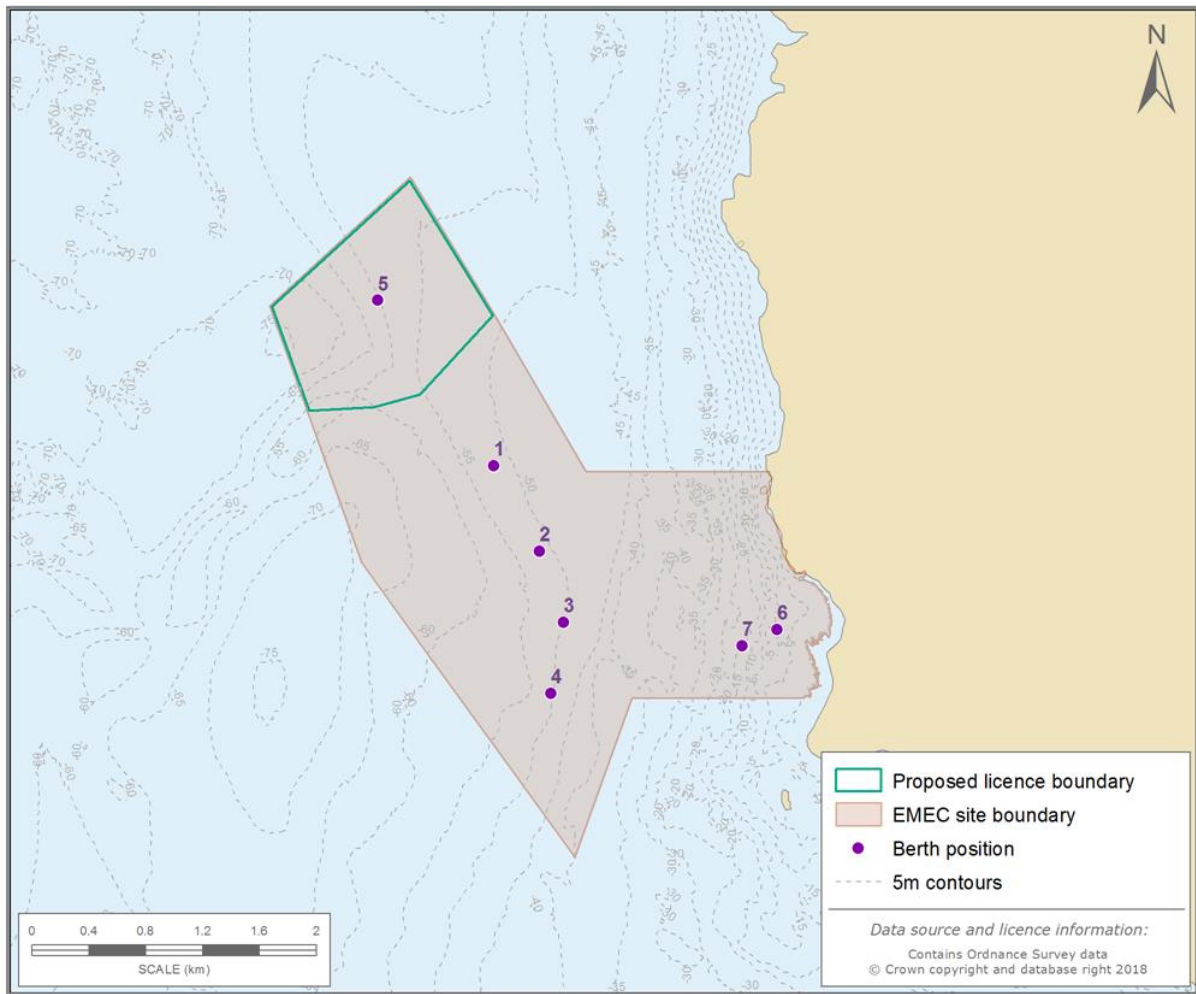


Figure 2. Proposed licence boundary for removal work (Source: ML06766/19/0)

## 5 Device overview

The Penguin device was installed at the Billia Croo test site in 2017, under the CEFOW project. Developed by Wello, the 2160-tonne Penguin device is around 30 meters long, nine meters in height and has a draft of around seven meters. The Penguin device has a unique simple design which is able to convert wave movement into power, with no moving parts outside the hull. The power generation is based on converting the movement of the waves to rotational kinetic movement inside the device by using the asymmetric shape of the hull. As the Penguin is based on continuous rotational movement the forces and the thus the wear of the component is reduced, and the power takeout is increased. The asymmetric shape of the Penguin's hull has been optimised for maximum power generation and operates optimally in water depths of 50m or more, which makes it very attractive considering the site development worldwide, as there is no need to restrict to near-shore sites.





Figure 3. Wello's Penguin installed at Billia Croo

A 6-legged catenary mooring system, where buoys are used to provide compliance is also installed onsite. Each mooring leg is built up of different sizes of chain and a subsurface buoy that has a marker buoy. Gravity based anchors have been used for each mooring leg. The following figure provides an overview of a single mooring leg.

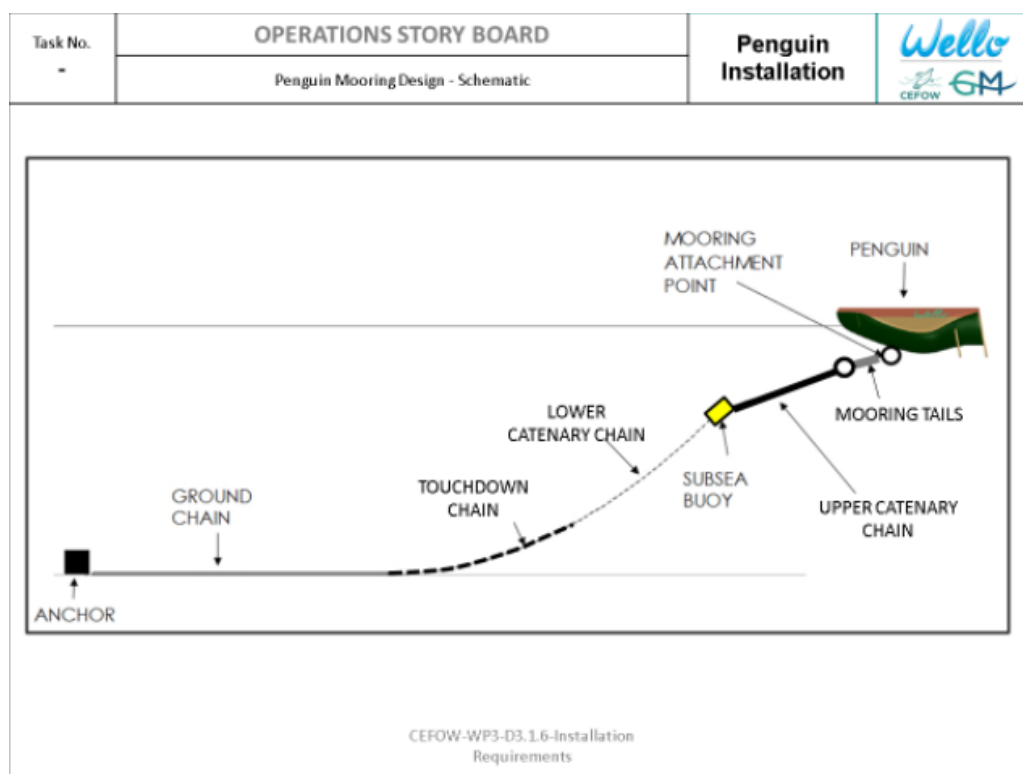


Figure 4. Breakdown of a mooring leg

## 6 Scope of removal work

The following table outlines the assets that are due be removed under this marine licence application

**Table 2. Assets to be removed from site during works**

Component	Materials	Weight or Volume
Clump weight anchors (x6)	Concrete	188m <sup>3</sup>
Subsurface buoys (x6)	Steel	10t (each) (total 60 tonne)
Chain	Steel	1800m (total 201 tonne)
Abandonment wire	Steel	5.2t
Hull	Steel	410t
Rotator	Steel and concrete	20t steel, 40t concrete (17m <sup>3</sup> )
Ballast	Concrete	631m <sup>3</sup>
Generator	Steel, copper, resin	60t (steel frame) 2t (copper windings) 100kg (resin coating)
Cooling water piping	Plastic	200kg (<1m <sup>3</sup> )
Transformers	Iron, aluminium, steel	5t (iron) 500kg (aluminium and steel combined)
Frequency converter	Steel, aluminium, copper, plastic	510kg
UPS	Steel and lead	200kg
Switch gears LV/HV	Steel, copper, aluminium, plastic	570kg
Tubing	Steel	300kg
Lubricant	Grease/oil	20kg/1000l
Coolant	Fresh water - glycol mixture	150 l
Paint (marine standard)		160kg
Electrical converter	Steel	200kg
Cable buoyancy	Plastic	1.5m <sup>3</sup>
Electric cables	Copper, PVC plastic	2 t (roughly 180m)
Bending restrictor	Polyester/rubber	20kg
Unused - Steel roll plates	Steel	2 x 77t 1 x 105t (total 259t)
Unused - Clump weights (x6)	Concrete	(14t each) 60m <sup>3</sup> in total

A technical description of the proposed removal work is provided in the method statement.

## 6.1 Environmental Monitoring

Monitoring has been conducted around the Wello Penguin device through the CEFOW project and through the current EMFF-cofunded SEA Wave project. In order to understand the potential environmental effects through the lifetime of a project, from installation to decommissioning, monitoring is planned to be conducted during and following the removal work. It is proposed to install a static hydrophone near to the test berth 5, in order to characterise the noise signature produced by the vessels involved in the works and the removal works itself. Static baited and unbaited cameras will be installed prior and post the removal works to understand in there has been a change in the species composition following the removal work. High definition towed camera array survey will be conducted the characterise the benthic ecology prior to and following the works. The data will be compared with that collected during the 2017, 2018 and 2019 monitoring campaigns around the device.

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## 6.2 Vessels

Exact specifications of the vessels will be dependent on the marine contractor appointed and the detailed method statements produced by them. The vessels to be used for the works will be confirmed with the regulator in due course.

## 6.3 Third Party Verification

It has been determined that a third party verification is not required due the works being limited to removal/decommissioning works.

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