

## ENVIRONMENTAL EFFECTS METADATA SURVEY FORM

Name

Tom Clements/Ian Hutchison

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Project name: Ocean Power Technology Moray Firth

Project description:

*Project Developer*: Ocean Power Technology

*Technology type*: OPT's PB 150

*Resource (wave, tidal)*: Wave

*Project scale (test site, prototype, array, commercial)*: Single demonstrator unit

*Installed capacity (MW)*: 150kW

*Project Website*: <http://www.oceanpowertechnologies.com/scotland.html>

*Launch Date*: 2011

*Additional Description*: OPT's first Mark 3 PowerBuoy (also known as the PB 150) was successfully deployed at sea in April 2011 by a team including Scotland-based Global Maritime Scotland Ltd and OPT, with the support of the Cromarty Firth Port Authority. The Mark 3 is the largest and most powerful wave power device designed by OPT to date and has concluded its ocean trials. The PB 150 is engineered to produce electricity in swells ranging from 1-6 metres in a minimum water depth of 55 metres.

The power buoy creates electricity from the vertical motion of the float relative to the stationary spar. This motion drives a mechanical system coupled to generators and produces AC electricity. The device is moored using a three point mooring system.

The installation methodology involved two separate phases – the mooring installation and the Power Buoy installation.

Mooring Installation: The mooring installation was undertaken using an anchor handling tug (AHT) equipped with a crane and associated support vessel(s). The AHT was loaded at Invergordon with all required equipment for installation of three anchors, together with all required auxiliary equipment. The AHT also had a work class ROV loaded.

Installation of the embedment anchors was carried out from the AHT. The AHT was assisted by appropriately rated and certified assist vessels (possibly a second AHT).

On completion of the moorings installation, the location was recorded and notified to the relevant authorities. The inboard end of each anchor cable was temporarily marked with a pennant buoy to enable the mooring to be picked up. The installation spread could then be demobilised back to port and the moorings left *in situ* while waiting for the installation of the Power Buoy<sup>1</sup>.

Power Buoy Installation: Once the PowerBuoy mooring system was installed, the device itself was towed to site and installed. The Power Buoy was towed by tugs from the construction yard at Invergordon to site, a distance of approximately 33 nm. The device was ballasted to a horizontal configuration and secured between two pontoons. The tow comprised of two tugs and two pontoons.

The operation to install the PowerBuoy was carried out immediately on arrival of the tow to site. The PowerBuoy was released from the pontoons and ballasted into an upright position under control of one of the tugs. The PowerBuoy had been pre-fitted with the mooring bridals and inner mooring lines which were connected to the outer mooring lines of the pre-installed mooring<sup>2</sup>.

Operation: The PowerBuoy was deployed for a period of 3 months. The PowerBuoy is designed for 5-yearly intervals between scheduled maintenance and thus no maintenance was planned or undertaken during this short deployment. Communications with the device were maintained during the deployment. A standby vessel made regular checks on the device but there was no physical interventions during the deployment.

Maintenance: There was no maintenance during the test period. OPT monitored turbine performance via the communications links with the device.

Vessel spread:

Vessel type	Activity	Comment
Anchor handling Tug (AHT)	Moorings Installation	Equipped with crane
Various smaller support vessels were also utilised throughout the deployment and operation of the device		

Location: Moray Firth, North Sea

Coordinates: 57° 55'.5N 3° 24'.0W

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<sup>1</sup> Aquatera Ltd. 2010. Navigational Risk Assessment for Deployment of the OPT PowerBuoy in the Moray Firth For Ocean Power Technologies Ltd.

<sup>2</sup> Aquatera Ltd. 2010. Navigational Risk Assessment for Deployment of the OPT PowerBuoy in the Moray Firth For Ocean Power Technologies Ltd.

Process Status: Deployed in April 2011, this project completed testing and has been removed from the site. The project is now complete.

Wave conditions encountered during the ocean trials included storm waves, and electrical power generated by the Mark 3 has included peaks of over 400 kilowatts. These levels of power exceeded OPT's expectations of performance for this first Mark 3 deployment, and verify that the system could produce significant energy in higher wave conditions.

The power take-off system's performance also exceeded expectations with respect to its energy conversion efficiency in the irregular ocean wave conditions encountered. Using information received during the trials, OPT's engineers calculated the power levels that should have been achieved by the Mark 3 and analyzed these against actual power generation. The result of this process confirmed the Company's ability to predict accurately the PowerBuoy's performance in varying wave conditions<sup>3</sup>.

Licensing information: Due to the scale and temporary nature of the deployment, OPT only required consent under the Coastal Protection Act.

Licence	Competent Authority	Reference
Coastal Protection Act (CPA)	Marine Scotland	Jan 2011 - 2SPC\4\12\2

#### Specific CPA Conditions

The works should be marked, and or lighted, as required by the Northern Lighthouse Board and remain so until the Scottish Ministers direct that the marking and/or lighting be altered or discontinued. It is therefore considered that:

- a) During the preparation, installation, maintenance and decommissioning phases adequate and prior notice should be given to the Mariner by means of local Notices to Mariners and Radio Navigation Warnings.
  
- b) The Power Buoy should be marked by a navigation light flashing yellow once every five seconds (Fl Y 5s) with a nominal range of 5 nautical miles. The topside structure should be painted yellow and fitted with a yellow multiplication cross top mark and a radar reflector. The elevation and positioning of the light should be such that it is clear of all obstruction and have all round visibility.
  
- c) The three surface tension buoys deployed as part of the mooring tensioning system must be coloured yellow and remain unlit.

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<sup>3</sup> OPT, Project Overview, available at <http://www.oceanpowertechnologies.com/scotland.html> as at 21 March 2014

d) The anchor marking buoys shall require to be coloured yellow, marked with a yellow St. Andrews cross, fitted with a radar reflector and each lit with a yellow light flashing once every five seconds (Fl Y 5s) with a nominal range of 2NM.

e) The Statutory Sanction of the Commissioners of Northern Lighthouses must be sought to exhibit the proposed new navigation light. Please find enclosed a copy of Northern Lighthouse Board's 'Application for Statutory Sanction' form, which should be completed in full and returned to the Northern Lighthouse Board for sanction prior to the deployment of the Power Buoy.

- A collision risk management plan should be developed for the operation to record the pre planning measures taken to minimize the risk of ship collision and to define the guarding role of the AHT and other support vessels whilst on location.
- The applicant should ensure that the OPT footprint (500m?) and associating workings maintain a safe distance and do not interfere with the 16" oil pipeline connecting the Beatrice field to Bakintore some 750 metres distant.
- Should the deployment extend beyond 1 May 2011 the applicant should liaise with Paul Thomson at the University of Aberdeen to ensure no conflict with their marine mammal monitoring programme in the same area.
- You are asked to make any application to renew this consent at least eight weeks before its expiry date. This consent shall not, unless renewed, continue in force after the expiry date of 22 November 2011.
- This consent shall cover all items detailed in the attached schedule. Any amendments or modifications to the works MUST be approved by the Scottish Ministers prior to its commencement.
- The Hydrographic Office, Ministry of Defence, Taunton, Somerset TA1 2DN MUST be informed of both the progress and completion of the works. The Hydrographic office must be supplied with a copy of this consent and foreshore plan to enable the works to be included on nautical charts.

Key Environmental issues: An Environmental Review (ER) was developed for this deployment for this deployment. This ER identified and assessed possible interactions between the deployed device and the environment. As part of this process 6 potential sites were reviewed against their impact on all relevant receptors. For the preferred site it was assessed that impact may occur on the following receptors:

- Cetaceans
- Ambient Noise levels
- Oil and Gas Sector
- Other sea users

- Mainly leisure craft

A Navigational Risk Assessment was also undertaken to support the Coastal Protection Act application.

Environmental webpage:



<b>Baseline studies and project effects studies: OPT Moray Firth Project</b>				
<b>General description</b> The following field surveys were undertaken (or commissioned by) the developer to inform baseline characterisation.				
<b>Receptor</b>	<b>Study description</b>	<b>Design and methods</b> (brief description)	<b>Results</b> (brief description)	<b>Status</b> (planned, underway, completed, with dates)
	None required or undertaken			

<b>Monitoring and adaptive management: OPT Moray Firth Project</b>				
<b>General description</b> No monitoring was undertaken prior to, during or following this deployment.				
<b>Receptor</b>	<b>Monitoring program description</b>	<b>Design and methods</b> (brief description)	<b>Results</b> (brief description)	<b>Status</b> (planned, underway, completed, with dates)
	None required or undertaken			