

## EMEC BILLIA CROO GRID-CONNECTED WAVE TEST SITE

Name of person filing the form

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Project name: EMEC Billia Croo Grid-Connected Wave Test Site

Project description

*Project Developer:* European Marine Energy Centre Ltd.

*Technology type:* Wave devices

*Resource:* MHK (wave)

*Project scale:* test site

*Export capacity (MW):* 4 MW

*Additional Description:* The European marine Energy Centre (EMEC) provides internationally recognized and independently accredited purpose-built, open sea test facilities that offer developers to opportunity to test full scale grid connected prototype devices. Five main test berths are available for developers to install moorings, cable connections, and the generating devices, grid-connected with 11 kV subsea cables.

A substation houses the main switchgear, the backup generator, and communications room for supply from each offshore device to the national grid. A met station provides real-time weather data which is send to the data centre. Two waverider buoys measure the wave height, period, and direction to be transmitted in real-time back to the data centre. This data centre has a suite of offices and data acquisition facilities including areas specifically for developers. Fiberoptic and VHF networks provide developers direct access to their device.

*Project Website:* <http://www.emec.org.uk/facilities/wave-test-site/>

Location: EMEC's wave test facility is ideally placed on the western edge of the Orkney mainland, Billia Croo, Stromness. Subjected to the powerful dynamic forces of the North Atlantic Ocean, it is an area with one of the highest wave energy potentials in Europe with uninterrupted Atlantic waves of up to 17m. Four of the test berths are at 50m depth, while the fifth is located at 70m depth, all situated 1-2 km from the shore and .5 km apart. Shallow water test facilities situated close to the substation are also available.

Coordinates:

59°N, 3°24.33'W; 58°58.386'N, 3°22.399'W; 58°57.431'N, 3°23.028'W; 58°58.529'N, 3°24.638'W;  
58°59.5'N, 3°25.33'W

Process status: The Centre was established with around £30 million of funding from the Scottish Government, Highlands and Islands Enterprise, the Carbon Trust, the UK Government, Scottish Enterprise, the European Union and Orkney Islands Council. Construction of the wave test facility was completed in October 2003 and operational activities commenced shortly after.

*Launch Date:* October 2003

Licensing information: The European Marine Energy Centre (EMEC) has been accredited with the UK Accreditation Service (ISO 17025) since 2005. EMEC has been granted the consents required to install an agreed 'envelope' of device types at these sites. Each developer is required to submit device-specific information to support amendment of these consents to allow installation of their device. This information includes a project summary and details on how the specific device details align with the EMEC environmental description and navigational risk assessment.

Environmental survey issues: A boulder beach fronts the wave test site at Billia Croo, flanked to the north by the sea cliffs of Black Craig and to the south by small cliffs and shelving bedrock. The species found are characteristic of a highly exposed rocky shoreline, such as the algae *Fucus distichus*. A full coastal survey of the flora and fauna has been undertaken – the results of which are illustrated below.

The seabed beneath the wave test site has sandy deposits towards the northern area with glacial till overlying shallow bedrock to the southern end. Surveys at deeper sites showed some hard substrata with the area predominantly supporting sedimentary biotopes and biotopes characteristic of sand scoured rock.

The marine region has typical plankton diversity for northern British coastal waters and local fish species are also present. With regard to ornithological importance, there are no internationally or nationally significant species residing here. Minke whale and Risso's dolphin have been sighted and records further offshore indicate that white sided dolphin, killer whale and pilot whale use the area for passage, although there are no known resident populations of cetaceans in the area.

The area is used for vessel passage, with the adjacent sea used by trawlers passing through on the way to fishing grounds. Inshore fishing takes place around the test area targeting lobster and crab species. The wave test site is located within a charted area to be avoided by vessels larger than 5,000grt.

Environmental Website: <http://www.emec.org.uk/facilities/wave-test-site/environmental-description-wave/>

**Baseline and project effects studies: EMEC Billia Croo Grid-Connected Wave Test Site**

<b>General description</b>				
Studies conducted prior to deployment.				
<b>Receptor</b>	<b>Study description</b>	<b>Design and methods</b>	<b>Results</b>	<b>Status</b>
Benthos	Multibeam and Sidescan bathymetry surveys.	Multibeam bathymetry at 1m spacing for wave site test area and 4m spacing for inner wave site test area. Sidescan conducted for both test area and inner test area.	General bathymetry maps show bedrock substrata to be characteristic of the shoreline of this region and extend steeply into the infratropical zone. The underlying bedrock continues to dominate the circalittoral zone, with the predominantly offshore sublittoral sediment reached at around 45-47m.	Completed
Marine Mammals	Categorization of cetacean presence.	Local cetacean recording via observation.	Present species include the harbor porpoise, minke whales, Risso's dolphin, white beaked dolphin, white-side dolphins, killer whales, and pilot whales. However, there are no resident cetacean populations in this area.	Completed
	Categorization of seal presence.	Local seal recording via observation.	Seals are observed in the area with the nearest known haul-out being recorded as Warebeth beach where sightings of up to 50 individuals have been reported.	Completed
Fish and Fisheries	Categorization of fish presence.	Local fish recording via observation.	Resident fish include saithe, Pollack, and ling. Other gadoids such as cod, whiting, and haddock appear seasonally. Migratory fish include herring and mackerel. Demersal species include monkfish, conger eel, and gurnards. Diadromous fish include Atlantic salmon, sea trout, and eel – though no important spawning burns are located in the vicinity.	Completed
Invertebrates	Categorization of invertebrate presence.	Local invertebrate recording via observation.	The rocky and boulder covered substrates of the inner coastal seabed provide habitats well suited to lobster, the brown crab, velvet crab, and the crawfish.	Completed
Birds	Categorization of bird presence.	Local bird recording via observation.	The nearby cliff habitats provide important nesting areas for many species of bird. However, the Royal Society for the Protection of Birds (RSPB) have confirmed that there are no populations of nationally or internationally important species.	Completed

Plants	Categorization of plant species.	A habitat survey was conducted in June 2002.	Although scarce and threatened plant species have been recorded in the vicinity of Black Craig, none were recorded along the proposed cable route.	Completed
Socio-Economics	Fisheries identification.	Discussions with local trawl operators.	An inshore fishery in the vicinity targets lobsters in depths of 33-38 m. Up to 7 vessels are thought to fish in the area adjacent to the proposed offshore wave site. The Orkney Islands Sea Angling Association passes by the area to reach better fishing areas near Marwick Head.	Completed
Socio-Economics	Shipping identification.	Connecting with local associations for discussions.	The proposed offshore test area is located within an area to be avoided (ATBA) by vessels >5000 grt with oil and other hazardous cargoes in bulk. Approximately 20 vessels use of pass through the wave site area.	Completed
Physical Environment	Hydrodynamic modeling.	DHI was commissioned to construct a numerical model of the Orkney Islands using the flexible version of MIKE 21 Flow Model FM.	The model provides detailed information at specified locations on water level, currents, and waves.	Completed
Reports or Papers	<ul style="list-style-type: none"> <li><a href="http://mhk.pnnl.gov/wiki/index.php/Marine_Energy_Test_Centre_Environmental_Statement">http://mhk.pnnl.gov/wiki/index.php/Marine Energy Test Centre Environmental Statement</a></li> </ul>			
Research Projects	<ul style="list-style-type: none"> <li><a href="http://www.emec.org.uk/research/">http://www.emec.org.uk/research/</a></li> </ul>			

Monitoring and adaptive management: EMEC Billia Croo Grid-Connected Wave Test Site				
General description		Post-license monitoring plans		
Receptor	Study description	Design and methods	Results	Status
Biology	Wildlife Observations Program.	A team of local wildlife experts that perform observations.	Inform on whether displacement or other alteration to behavior and distribution occurs in the resident wildlife due to the presence and operation of devices.	Ongoing

Noise	Acoustic Monitoring Program.	A project to develop a methodology and procedure for characterizing the acoustic output of devices.	Results can be used to establish a baseline data set.	Ongoing
Invertebrates	Inshore Crustacea Fisheries Project.	This project will monitor the abundance of lobster at the Billia Croo test site and release hatchery reared tagged juveniles.	Informs the abundance and availability of crustaceans to the local Orkney fishery.	Ongoing
Physical Environment	Wave resource assessment.	The International Centre for Island Technology (ICIT) was commissioned to undertake routine monthly analysis of the MetOcean data.	This data produces reports that are available to developers deploying at the wave site to inform them of the site conditions to aid in design, assessment, and deployment.	Ongoing
	Surface interaction with wave devices	Remote observations from a high magnification camera mounted on the Black Craig observations point.	This can inform device operators and regulatory decision makers about the frequency and nature of any specific interactions between device and wildlife.	Ongoing
Socio-Economics	Marine safety course.	This project provides the minimum sea safety certification required for people to work offshore in the marine renewables industry.	This demonstrates the safe and efficient deployment and retrieval of a current profiler.	Ongoing
Reports or papers	<ul style="list-style-type: none"> <li>• <a href="http://mhk.pnnl.gov/wiki/index.php/Guidance_for_Developers_at_EMEC_Grid-Connected_Sites">http://mhk.pnnl.gov/wiki/index.php/Guidance for Developers at EMEC Grid-Connected Sites</a></li> <li>• <a href="http://mhk.pnnl.gov/wiki/index.php/Marine_Energy_Test_Centre_Environmental_Statement">http://mhk.pnnl.gov/wiki/index.php/Marine Energy Test Centre Environmental Statement</a></li> <li>• <a href="http://mhk.pnnl.gov/wiki/index.php/Navigational_Safety_Risk_Assessment_of_the_Wave_Test_Site_at_the_European_Marine_Energy_Centre">http://mhk.pnnl.gov/wiki/index.php/Navigational Safety Risk Assessment of the Wave Test Site at the European Marine Energy Centre</a></li> </ul>			
Research projects	<a href="http://www.emec.org.uk/research/">http://www.emec.org.uk/research/</a>			