

WAVE HUB

Name of person filing the form

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Project name: Wave Hub test site

Project description

Project Developer: South West Regional Development Agency (SWRDA)

Technology type: wave devices

Resource: wave

Project scale: prototypes

Installed capacity (MW): 20

Additional description: Wave Hub represents shared offshore infrastructure for the demonstration and proving of arrays of wave energy generation devices over a sustained period of time. It consists of a 12 ton electrical hub on the seabed to which wave energy devices can be connected. The hub is linked to the UK's grid network via a 25km, 1300 ton subsea cable operating at 11kV. The project holds a 25-year lease for eight square km of sea and has permits for up to 20MW of wave energy generation. Four separate berths are available to lease, each with a capacity of 4-5MW.

Project website: www.wavehub.co.uk

Location: A wave energy demonstration and proving site located at 50 m water depth 16 kilometres off the north coast of Cornwall in South West England. Coordinates 50° 20'.700 N 05° 37'.230 W; 50° 22'.830 N 05° 37'.760 W; 50° 20'.860 N 05° 35'.560 W; 50° 22'.980 N 05° 36'.100 W.

Licensing information: On 23 June 2006, a consent application under Section 36 of the Electricity Act (EA) 1989 was filed with the Department of Business, Enterprise & Regulatory Reform (DBERR). At the same time, a consent application under the Coast Protection Act (CPA) 1949 as well as the FEPA (Food and Environment Protection Act) license application were filed with the Department for the Environment, Food and Rural Affairs (DEFRA).

Process status: An EIA was completed following a preliminary scoping study and the related Environmental Statement was submitted with all the applications. Following application an extensive period of public consultation was then undertaken which was completed in March 2007. Consents were then granted in September 2007 and the FEPA license was granted in December 2007. An additional FEPA license for cable stabilization operations was granted in August 2010. The cable and the Wave Hub were completely installed and connected to the grid in November 2010.

Environmental survey issues: Many of the large marine vertebrate species known to occur in the region, particularly grey seal, harbour porpoise, bottlenose dolphin (all listed in the European Habitats Directive as in need of protection) and common dolphin (IUCN Red List), are protected by

National, European &/or international legislation, and thus monitoring of these populations to determine impacts in the vicinity of MREIs is required. Other species utilising the region seasonally or infrequently include basking sharks (listed as *Vulnerable* on the IUCN Red List), leatherback turtles (*Critically endangered*, IUCN Red List) and numerous species of cetacean (e.g. minke whales, pilot whales). Data on the current distribution and abundance of these species in the area is limited, particularly over seasonal and inter-annual timescales. Monitoring is therefore being conducted to gain a coherent understanding of distribution, to inform regulators on whether potential mitigation might be required during WEC installation.

The installation of WECs will alter the sea bed habitat by introducing structure and reducing the impact of towed fishing gear. It is therefore important to monitor benthic communities in order that both positive and negative impacts of any MREI can be quantified. The research at Wave Hub also aims to determine, with regard to future Marine Spatial Planning initiatives in the UK, whether MREIs act as *de facto* Marine Protected Areas by comparing the changes which occur at Wave Hub with other nearby new Marine Coastal Zones.

Environmental webpage: www.sowfia.eu / www.wavehub.co.uk / www.primare.org. Contacts for environmental issues: Matthew Witt, University of Exeter, m.j.witt@exeter.ac.uk.

Baseline studies				
General description				
Receptor	Study description	Design and methods	Results	Status
Physical environment	Wave measurements and numerical modelling to predict the potential impacts of WEC devices on the wave regime	An industry recognised modelling package was calibrated using 13 months of monitored wave data (from January 2005 to April 2006) and 17 years Met Office wave model data.	Shoreline wave attenuations of 0-15% might be expected and limited local beach elevation changes were predicted to be limited to less than 0.2m.	Completed
Physical environment	Study on contaminant risk of marine sediments and resuspension potential.	Sediment sampling and analysis.	No significant contamination identified. Some sediment is expected to be suspended into the water column during construction, but localized and of short duration.	Completed
Acoustic environment	Describe ambient sound field and surrounding regions prior to installation of Converters	Comparison of noise data with species-specific audiograms, providing information on acoustic (hearing) sensitivity for cetaceans and fish species. Broad-band sound recorders, 1 TB memory, with dual channel hydrophone will be used	Preliminary data gathered, full scale data collection commencing 2011	Completed

Marine Ecology	Baseline survey of intertidal ecology performed	Field survey	No likely impact identified.	Completed
Marine Ecology	Baseline survey of sub-tidal ecology performed	Field & desk study	Diverse communities associated with the sand, pebble and rocky seabed. Disturbances predicted to mainly occur due to the placement of infrastructure on the seabed with the works to be of low impact, short duration and limited spatial extent. Longer term effects on subtidal ecology predicted to be negligible. The most notable impact would be associated with rock dumping for cable protection. Mitigation was proposed by keeping rock dumping to a minimum as the last resource to mitigate cable spanning.	Completed
Marine Ecology	Study of marine mammals and elasmobranchs	Desk based studies and marine mammal surveys.	Offshore area is most important for basking sharks and bottlenose dolphins. Expected noise levels likely below the threshold at which noticeable effects on marine mammals. Some monitoring was recommended reflecting uncertainty of this prediction. EM fields relatively localised to the route of the sub-sea cable along the seabed. Pelagic species should be unaffected while benthic species may be attracted to the cable. No effect on population levels is expected since damage to individuals should not occur.	Completed
Birds	Bird surveys performed		Wave Hub not sited in areas designated of international or national level of importance for seabirds. No significant impact on offshore birds is predicted during brief construction activities. Similarly, no significant impact was predicted during operation because of the relatively small-scale of the development in the context of the surrounding open sea area	Completed
Fish and fisheries	Existing fish resource conditions were determined	Four multi-gear fishing surveys as well as a commercial fisheries study (based on fish landing statistics, fisheries surveillance data, academic studies, previous fisheries reports) and consultation with	Short-term interference with fishing activity will be mitigated through navigation measures, Notices to Mariners, liaison with local fishermen and other measures. Potential interference of fishing gear (e.g. snagging) by the sub-sea cable. Exclusion of fishing activity from the deployment area and safety zones around the WECs, potentially displacing established fishing grounds and adding pressure to neighbouring	Completed

		local fishermen.	fishing areas. Prevention of fishing expected, however, to benefit fish resources within the area in which fishing is excluded and this has the potential to benefit fish resources outside the safety zones.	
Navigation	Vessel traffic surveys and a navigation risk assessment were undertaken.	The navigation risk assessment involved a detailed computer modelling of the risk of collisions between vessels and with WEC devices as a consequence of the presence of Wave Hub. Supplemented by consultation with navigational stakeholders.	Separation of opposing flows of traffic due to Wave Hub presence is likely to reduce encounters between vessels and, therefore, reduce vessel-to-vessel collision risk. Overall collision risk is estimated to increase slightly but associated impacts are predicted to be low.	Completed
Other	Archaeological assessment	Desk based study and on-site geophysical survey performed	No protected wreck sites exist within the site but a number of known wrecks are present in the wider area. The geophysical survey identified a number of anomalies on the sea-bed that could be attributed to features of possible archaeological interest.	Completed
Other	Rare Threatened and Endangered (RTE) species assessment	Observe occurrence and behaviour of RTE species around the 6-pack	No RTE species observed	Completed
Reports or papers	Environmental Impact and Appraisal – Planning Consent for the South West of England Wave Hub, 2008, Nick Harrington, Nick & Inma Andina-Pendás, presented at Oceanology 2008, London (available at http://www.wavehub.co.uk/information_for_developers/idoc.ashx?docid=b2b42f55-fae8-43a7-8978-8d710fb79543&version=-1)			
Research projects	PRIMaRE (www.primare.org)			

Monitoring and adaptive management				
General description		Proposed post-license monitoring plans		
Receptor	Study description	Design and methods	Results	Status
Physical environment	Confirm modelled impacts on wave field.	Wave monitoring upstream and downstream of the deployment area.		Not completed but continued loss of wave buoys. Experiments with ADCP point measurements and HF Radar measurement.
Physical environment	Underwater Noise Evaluation	Monitor noise and vibration of WECs to assess impact inform the need for further mitigation		Not completed
Physical environment	Coastal impact monitoring	Measure beach profiles prior to installation to gain a better understanding of sediment dynamics.		-
Marine Ecology	Impacts on benthic ecology	Regular ROV inspections to confirm positioning of the sub-sea cable and assess impact on benthic habitats		-
Marine ecology	Surveys for marine mammals, basking sharks and sea birds	Monthly boat-based surveys – visual counts		Surveys ongoing
Marine ecology	Water column structure (plankton and CTD)	Monthly vertical trawls at three locations (1 at Wave Hub and 2 control locations)		
Marine ecology	Surveying sessile and mobile benthic fauna	(a) Beyond-BACI design using baited video cameras. To be conducted at 3-5 sites, inc. Wave Hub. (20-30 replicates at each site) 2-3 times per annum (b) HD video mounted on a flying array. Annual survey.		Preliminary data gathered, full scale data collection commencing 2011
Marine ecology	Monitoring of odontocete habitat use	Static acoustic monitoring using C-PODs		Ongoing
Marine ecology	Large cetacean (Mysticete) monitoring	Broad-band sound recorders, 1 TB memory, with dual channel hydrophone		Preliminary data gathered, full scale data collection commencing 2011
Marine ecology	Crustacean survey	Anticipated monthly crustacean survey using 40 creel pots at 2 sites on the north coast of Wave Hub. Time-lapse cameras also to be installed to investigate species accumulation rates		To begin 2011
Reports or papers				
Research projects		PRIMaRE (www.primare.org); SOWFIA (www.sowfia.eu)		