

**4th CSPCWG MEETING
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Paper for Consideration by CSPCWG

Symbol(s) for Offshore Renewable Energy Installations

Submitted by:	UK
Executive Summary:	When symbols for wind turbines/farms and current turbines/farms were designed, it was known that other forms of Offshore Renewable Energy Installations were being developed, but there was insufficient information available to design appropriate chart symbols. The technology is moving fast and installations are already being deployed. Hydrographic offices need to have some guidance on how to chart such installations.
Related Documents:	M-4. INT 1
Related Projects:	none

Introduction / Background

The following extracts are from UK's Maritime & Coastguard Agency's (MCA) draft guidance to mariners operating in the vicinity of offshore renewable energy installations (OREI):

Unlike Wind Farms, systems using wave or tidal energy may not be clearly visible to the mariner. The following definitions and acronyms are used in this industry:

Wave Generator – any individual surface or sub-surface structure incorporating a generator moored to the seabed and connected to an electrical terminal. An example is 'Pelamis' which consists of large linked floating cylinders which are connected by a hydraulic system. Potential energy is stored via hydraulic rams, which operate as the hinged units move in the waves. The generated pressure is used to drive turbine generators inside the cylinders. Other types may use wave action to elevate water to a reservoir above sea level, creating an artificial 'head' of water which is subsequently released through a number of water turbines. For all types, the generated power is transmitted ashore either by submarine cables or via a 'Wave Hub' to a submarine cable connecting it to the transformer station ashore. (Note: for more details, see Annex)

Wave Generator Field – A group of individual wave generators, located in one block and considered to be a unit, moored to the seabed and/or each other and connected to an electrical hub.

The relevant Hydrographic Office should be informed of the establishment of an energy extraction device or field, to permit appropriate charting of same.

Analysis / Discussion

Experimental wave generator fields already exist in the Orkney Islands, north of Scotland (Admiralty Chart 2562). Extracts from news report in the annex indicate that much larger fields are shortly to be established SW of England and in Portuguese waters (see Annex). A trawl of the internet shows that similar developments are taking place around the world. It also indicates that the devices vary considerably in shape, size and whether they are on or under the sea surface.

When symbols for wind turbines/farms and current turbines/farms were designed, it was known that other forms of OREI were being developed, but there was insufficient information available to design appropriate chart symbols. The technology is moving fast and installations are already being deployed. Hydrographic offices need to have some guidance on how to chart such installations.

With the wide variety of devices in use and still being developed, it is unlikely that a suitable generic 'pictorial' symbol can be designed for the actual device. However, these devices need protection and are also potentially dangerous to navigation. They therefore need to be charted. It is suggested that an outer limit with a suitable legend and associated note is the most practicable solution.

It may be necessary for hydrographic offices to lobby appropriate authorities to designate an outer limit. If none is designated, the legend should be centered in the area and spread to give an indication of the extent of the known area in which the devices are deployed, without actually charting an outer limit.

It is suggested that these should (at the present stage of the industry) usually be treated as Development Areas (draft B445.7); that is, in magenta as the actual obstructions will come and go or be moved as experiments progress. Later, if such areas become 'Production Areas', the outer limit could be black (as with oilfields), unless there are restrictions (which seems very likely) in which case N2.1 or 2.2 would be used.

It is suggested that the legend should be 'Offshore Renewable Energy Installations - Development Area (see Note)' and the note would be something like:

'Extensive testing of offshore renewable energy installations, both above and below the surface, takes place in this area. Mariners should exercise extreme caution if navigating in this area. For further information, consult [the] Sailing Directions.'

Small areas may be just labeled Development Area (see Note). In time, perhaps OREI may become a recognized INT abbreviation.

Of course, all cables, buoys, lights and permanent structures should be charted as normal.

Conclusions

There is an urgent need to produce some guidance on charting OREI areas.

Recommendations

A specification to be drafted and added, as a separate paragraph, to the draft B-445.7.

Justification and Impacts

- Rapid developments in the industry means that devices are already being deployed offshore which are dangerous to navigation. Such devices must therefore be charted.
- A consistent approach to charting is desirable.
- May slightly delay the publication of the revised section B-440.

Action required of CSPCWG

The CSPCWG is invited to:

- a. share information about OREI developments in their waters
- b. discuss the recommendations
- c. decide how to chart OREI and include the advice in IHO publication

Extracts from the Internet

1. The UK Government has given planning approval for the world's first large scale wave farm off the coast of Cornwall in South West England. Wave Hub is a world first and will include an onshore substation connected to electrical equipment on the seabed about 16 kilometres (10 miles) offshore via a sub-sea cable. Companies developing wave energy technology will be able to plug into Wave Hub to test their wave energy devices on a scale never seen anywhere before.

The Wave Hub project will cover an area of sea measuring four kilometres by two kilometres and each wave device developer will be granted a lease of between five and 10 years in an area of approximately two square kilometres. The water at the deployment site is approximately 50 metres deep. Up to 30 wave energy devices are expected to be deployed at Wave Hub and will float on the surface of the sea. Wave Hub is expected to be operational in 2009.

2. Scottish engineers will soon deploy an offshore "wave farm" in Portugal. The firm has already deployed a prototype system around the Orkneys off the coast of Scotland. They have also signed a deal to build an even larger farm in Scottish waters.

Construction of the wave farm in Portugal has been underway for the past year in a busy shipyard in the Portuguese coastal town of Peniche. Engineers are building large devices called the Pelamis system. They are massive, red, steel tubes that look like rounded train cars.



3. The development of the first subsea commercial wave farm by a Scottish company took another important step forward today (Tuesday February 20th 2007) with news that Scottish wave energy company, AWS Ocean Energy Ltd. based in Alness, Ross-shire, has secured £2.128 million funding from the Scottish Executive.

The Archimedes Wave Swing is submerged at least six metres below the sea surface which, as well as removing visual impact and hazards to shipping, avoids high storm impacts. Compared to most other wave energy devices, the Wave Swing also takes up a proportionately smaller area of the sea, in relation to power generated. Following a successful pilot project in Portugal, the £2.128 million will be used to develop a pre-commercial model of the device at the European Marine Energy Centre (EMEC) in Orkney.

