AISM Association of Internationale de Signalisation Maritime IALA International Association of Marine Aids to Navigation and Lighthouse Authorities

IALA Recommendation O-131

On

The Marking of Offshore Wave and Tidal Energy Devices

Edition 1

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IALA Recommendation the Marking of Offshore Wave and Tidal Energy Devices

(Recommendation O-131)

THE COUNCIL:

NOTING the function of IALA with respect to safety of marine navigation, the efficiency of maritime transport and the protection of the environment;

NOTING ALSO the provisions contained within the IALA Maritime Buoyage System (MBS), and related IALA Recommendations and IALA Guidelines;

RECOGNISING the significant hazard to shipping posed by the development of surface and sub-surface energy extraction devices;

RECOGNISING ALSO that it is a matter for a National Authority to assess the navigational requirement and the risk involved, and decide on how wave and tidal devices need to be marked;

RECOGNISING FURTHER that marking of wave and tidal energy devices is intended to preserve the safety of navigation, protect the marine environment and the energy generating devices themselves;

HAVING CONSIDERED the proposals by the IALA Aids to Navigation Management Committee and taking into account IALA Recommendations O-117 on the Marking of Offshore Wind Farms and O-114 on the Marking of Offshore Structures;

RECOMMENDS that:

1. Wave and Tidal Energy Devices are marked so as to be conspicuous by day and night, with consideration given to prevailing conditions of visibility and vessel traffic;
2. National Members take into consideration the Annex to this Recommendation when marking Offshore Wave and Tidal Energy Devices.

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Annex

The Marking of Offshore Wave and Tidal Energy Devices

1. Introduction

There are an increasing number of offshore structures, which may affect shipping. IALA is monitoring the development of these structures and will continue to create and update documentation as required to ensure clear and unambiguous marking of waterways for safe navigation, protection of the environment and protection of the structures themselves. Authorities facing problems in this field are invited to bring them to the attention of IALA to obtain advice on current practice.

1.1 Background

This Recommendation on the Marking of Wave and Tidal Energy Devices is the first to deal with this particular issue and follows the Recommendation on the Marking of Offshore Wind Farms (O-117), first published in May 2000 and re-issued following review in December 2004. At the present time, offshore wave and tidal energy developments are comparatively rare and sites relatively small. However, in recent years, many National Authorities have made decisions to increase the percentage power created through renewable energy options. This has resulted in many offshore areas and navigable waters being designated for renewable energy development. The number of installations in such developments is therefore likely to increase and some sites have proposals for large numbers of wave and tidal generators.

In general, any risk assessment of offshore wave and tidal extraction devices will likely determine that, when compared to gas and oil structures, there is a lower risk of either pollution or loss of life should a vessel foul such an installation. Consequently, the marking requirements can be mitigated. It should be born in mind that many wave and tidal devices are low freeboard floating structures that are moored to the seabed. They may be moored in deep or shallow water and some may be located on the seabed or just below the surface. Surface piercing and subsurface elements may extend laterally beyond the surface elements. This could include shared moorings and mid-water connections between units which may also carry electricity, control signals, hydraulics or pneumatics associated with the units. It should also be noted that many tidal concepts have fast-moving sub-surface elements such as whirling blades, and these should be taken into account when identifying the marking requirements. (see Annex for visual representation of various devices)

1.2 General

Consultation between the stakeholders such as Developers, National Administrations, Aids to Navigation Authorities, Competent Authorities and wave and tidal contractors should take place at an early stage. In general, development of offshore energy structures should not prejudice the safe use of Traffic Separation Schemes, Inshore Traffic Zones, recognised sea lanes and safe access to anchorages, harbours and places of refuge. On a case-by-case basis, National Authorities may consider establishing Exclusion or Safety Zones, which would prohibit or restrict vessels from entering Offshore Wave and Tidal Energy fields. Such information should be shown on the navigation chart, as appropriate.

In order to avoid confusion from a proliferation of Aids to Navigation in a high-density wave and tidal energy extraction field, full consideration should be given to the use of synchronised lighting, different light characters and varied light ranges.

There has been some evidence that sea-bed scouring at the bases of offshore renewable energy installations in areas of strong tides or currents has resulted in significant deposits of material in other locations. Some authorities have insisted on fitting depth monitoring devices to such installations to measure scour. This may need to be considered when approving wave and tidal energy extraction proposals/locations.

2. Scope

This recommendation is for the guidance of stakeholders such as National Administrations, Lighthouse Authorities, Aviation Authorities and other competent Authorities, Aids to Navigation providers, and wave and tidal energy extraction contractors and developers.

3. Definitions & Acronyms

Wave Generator - any individual surface or sub-surface structure incorporating a generator, moored to the seabed and connected to an electrical terminal.

Tidal Generator - any individual surface or sub-surface structure incorporating a generator , fixed or moored to the seabed and connected to an electrical terminal via cable(s).

Wave Generator field - a group of individual wave generators, which are located in one block and are considered to be a unit, moored to the seabed and/or each other and connected to electrical hub.

Tidal Generator field - a group of individual tidal generators, which are located in one block and are considered to be a unit, fixed or moored to the seabed and/or each other and connected to an electrical terminal via cable(s).

Energy Extraction Device (EED) - a wave or tidal generator as defined above.

Transformer Station (hub) - a special structure within or outside the wave and/or tidal energy extraction field to which the individual generators are connected via a power cable. Power is transferred ashore from the transformer station by submarine cable. A 'hub' may be a separate fixed or floating platform, a unit very similar to the generators but carrying additional power conversion equipment.

4. Considerations During Construction / Decommissioning

During the construction / decommissioning of an offshore wave and/or tidal energy extraction device or field, working areas should be established and marked in accordance with the IALA Maritime Buoyage System (MBS). National Authorities should also consider the use of guard ships in areas of high traffic density.

Notices to Mariners, Radio Navigational Warnings – NAVTEX and/or broadcast warnings must be promulgated in advance of and during any offshore wave and/or tidal energy extraction device construction.

During construction, power cables between wave and tidal generators, between such generators and the transformer station, and between the transformer station and the

shore should be sufficiently trenched to avoid exposure from scouring / sand migration or trawling activities.

Where individual wave and/or tidal energy devices extend above the surface careful consideration needs to be given to any additional temporary marking that may be requires during the construction / decommissioning phase.

When decommissioning such devices, the Authority should ensure that the operator / contractor is obliged to remove all obstruction so the sea bed is returned to its original depth and topography. In the event that any residue or obstruction remains that, in the opinion of the Aids to Navigation Authority, constitutes a danger to navigation, then the residue or obstruction shall be marked according to the authority's requirements.

5. Marking of Wave and Tidal Energy Devices

Wave and Tidal energy extraction devices should be marked as a single unit or as a block or field as follows:

a) When structures are fixed to the seabed and extend above the surface, they should be marked in accordance with the recommendations contained in the marking of offshore wind farms – 0-117.

b) Areas containing surface or sub-surface energy extraction devices (wave and/or tidal) should be marked by appropriate navigation buoys in accordance with the IALA Buoyage System, fitted with the corresponding topmarks and lights. In addition, active or passive radar reflectors, retro reflecting material, racons and/or AIS transponders should be fitted as the level of traffic and degree of risk requires.

c) The boundaries of the wave and tidal energy extraction field should be marked by Navigational Lighted Buoys, so as to be visible to the Mariner from all relevant directions in the horizontal plane, by day and by night. Taking the results of a risk assessment into account, lights should have a nominal range of at least 5 (five) nautical miles. The Northerly, Easterly, Southerly and Westerly boundaries should normally be marked with the appropriate IALA Cardinal mark. However, depending on the shape and size of the field, there may be a need to deploy lateral or special marks.

d) In the case of a large or extended energy extraction field, the distance between navigation buoys that mark the boundary should not normally exceed 3 (three) nautical miles.

e) Taking into account environmental considerations, individual wave and tidal energy devices within a field which extend above the surface should be painted yellow above the waterline. Depending on the boundary marking, individual devices within the field need not be marked. However, if marked, they should have flashing yellow lights so as to be visible to the mariner from all relevant directions in the horizontal plane. The flash character of such lights should be sufficiently different from those displayed on the boundary lights with a range of not less than 2 nautical miles.

f) Consideration should be given to the provision of AIS as an Aid to Navigation (IALA Recommendation A-126) on selected peripheral wave and/or tidal energy devices.

g) A single wave and/or tidal energy extraction structure, standing alone, that extends above the surface should be painted black, with red horizontal bands, and should be marked as an Isolated Danger as described in the IALA Maritime Buoyage System.

h) In the case of a single wave and/or tidal energy device which is not visible above the surface but is considered to be a hazard to surface navigation, it should be marked by an IALA special mark yellow buoy with flashing yellow light with a range of not less than 5 nautical miles, in accordance with the IALA Buoyage System. It should also be noted that many tidal concepts have fast-moving sub-surface elements such as whirling blades.

i) The Aids to Navigation described herein should comply with IALA Recommendations and have an appropriate availability, normally not less than 99.0% (IALA Category 2).

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

k) Notices to Mariners should be issued to publicise the establishment of a wave and/or tidal energy device or field. The Notice to Mariners should include the marking, location and extent of such devices/fields.

6. Contingency Plans

a) Operators of wave and/or tidal energy extraction devices or fields should develop contingency plans and emergency response plans which address the possibility of individual devices breaking loose and becoming floating hazards. Automatic location and tracking devices should be considered.

b) Developers and/or operators should have a reliable maintenance and casualty response regime in place to ensure the required availability targets are met. This will include having the necessary AtoN spares on hand, with provision made at the design stage, where necessary, to ensure safe access.

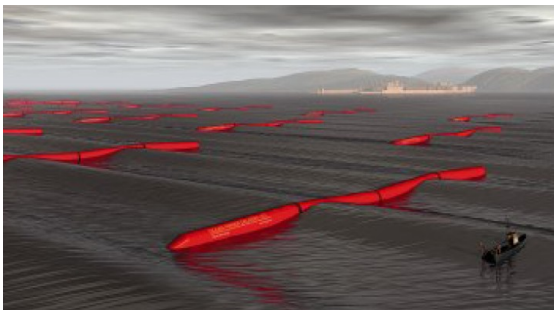
7. Additional Considerations

Depending on the marking, lighting and lateral separation of the field boundary, the additional marking of the individual structures within an energy extraction field, visible above the surface of the sea, may be considered as follows:

- Lighting of each structure.
- Individual structures unlighted with retro-reflective areas.
- Individual structures illuminated with down-lights on ladders and access platforms.
- Use of flashing yellow lights with a range of not less than two (2) nautical miles.
- Identifying numbers on each individual structure, either lit or unlit.

An electrical transformer station or other structure, if considered to be a composite part of the energy extraction field, should be included as part of the overall marking. If not considered to be within the boundaries of the field, it should be marked as a single stand alone device as described in Section 5 - section 5g) or 5h) refers.

ANNEX – Examples of Wave and Tidal Energy Devices[1]



Pelamis, Ocean Power Delivery (note – as per section 5e)
recommended colour of unit above the water line is yellow)

Marine Current Turbine, Seaflow Project (note – as per section 5g)
marked as isolated danger)

Marine Current Turbine, Seaflow Project (multiple units with fast-moving sub-surface elements extending laterally beyond surface elements – artists rendition)

[1] All images provided courtesy of British Wind Energy Association