

Draft Proposal for New Marine Renewable Energy Standards / Guidelines

March 2014



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1. Introduction

Marine Renewable Energy, as an emerging industry, needs to continue to establish credibility by developing proven reliable technologies for energy conversion from both wave and tidal stream resources. The commercial potential of a technology rests in demonstrating reliability of performance and an acceptable cost of energy. Innovation is required not only in device design and initial feasibility and reliability testing, but also for developing efficiencies across the scope of all activities from design, manufacture, operations and maintenance through to final decommissioning.

The key benefits of standards include:

- Provides a basis for effective self-guidance/regulation that provides the benefit of informed recommendations, whilst reducing the likelihood of stifling the development of the industry through over-regulation.
- Reduces the risk for investors supporting the development of new devices and their deployment in large scale development projects.
- Opens up international markets to UK technology and project developers
- Creates a platform for knowledge sharing that helps to avoid duplication of effort and reduces the cost of the technical learning curve.
- Assists the definition of existing and future functional requirements of installation vessels and other marine equipment.
- Improves skills transfer and cross-industry communication.
- Encourages a consistent approach to safety and the management of risk, both within and between projects.

Four areas for the development of new standards/guidelines have been identified: Installation and Offshore Construction; Operation & Maintenance; Subsea Cable Lifecycle; and Environmental Guidelines.

This document proposes the outline scope for the development of documentation covering these four areas, intended to be developed and issued in the format of Technical Specifications written to comply with the structure of standards.

2. Installation and Offshore Construction

Sections of this proposed draft would include guidelines for the following:

Planning / Engineering. Careful planning of installation and the related engineering must start far in advance of any installation activity due to the need to book vessels, crew and essential technical support in a busy market. The engineering phase can review available options and ensure that any aspects of installation that reflect back on equipment design can be accommodated.

Load-out and Transportation. Getting large items of plant and machinery from fabrication yard to the water requires significant engineering input and is location dependent due to availability of cranes; water depths alongside the load-out quay and many other considerations.

Offshore Construction. This includes towing; heavy lifting or submerging; ballasting or securing at the seabed. These options must be screened to identify the most cost effective approach. Detailed engineering plans and operational procedures for the chosen method must follow.

Standard Hazard Identification & Risk Assessment (HIRA). It is suggested that a careful procedure be formulated and a typical Risk Register possibly be included as an appendix. This may also include guidelines for the HIRA meetings that are required in advance of all works.

Other relevant topics that could be included are:

- Practical installation method outlines for generic device types or building blocks e.g. piles; gravity bases; ballast; moorings and cable interfacing.
- Competences of key people required – to assist in recruitment or procurement of labour services as well as meeting legislative requirements.
- Identification and resolution (where possible) of uncertainties or conflicts within existing Codes.
- Indication of required Design Criteria not covered by existing Codes.
- Identification of typical minimum functional specifications of equipment, i.e. cranes, vessels, winches, mooring.
- List of relevant sections within existing Codes, Standards and Recommended Practices (including ensuring list remains current).
- List of relevant legislation (including ensuring list remains current).

A proposed outline 'contents page' for this Standard/guideline is given below.

Contents of Installation and Offshore Construction Document

1. SCOPE
2. NORMATIVE REFERENCES
3. TERMS AND DEFINITIONS
4. SYMBOLS, UNITS AND ABBREVIATIONS
5. PLANNING & ENGINEERING
 - Calculations
 - Procedures
 - Health & Safety
6. LOAD-OUT & TRANSPORTATION
7. OFFSHORE CONSTRUCTION
 - Moorings
 - Foundations
 - Submerging
 - Ballasting
 - Piling
 - Securing
8. HAZARD IDENTIFICATION & RISK ANALYSIS
9. REVIEW OF METHODS (DIFFERENT TYPES OF DEVICE)
 - Moorings
 - Foundations
 - Submerging
 - Ballasting
 - Piling
 - Securing
 - Diving
10. COMPETENCE OF PEOPLE
 - Supervision
 - Technicians
 - Semi-skilled labour
11. DESIGN CODES
 - Uncertainties and conflicts
 - Un-codified aspects
12. REPORTING DOCUMENTATION GUIDE
 - Structure of documents/reports
 - Control of documents
 - Reporting Exceptions to Codes and Established Practice
13. APPENDICES
 - List of relevant sections within existing codes and standards
 - List of relevant legislation

3. Operations and Maintenance

The sections of the draft will include the following:

Requirements for Onshore Support Facilities. This section will summarise the range of facilities typically needed in ports and harbours from which servicing is to be based. It may include some norms for storage space requirements for loading vessels and the quay areas necessary.

Typical Service Vessel Requirements. This section will describe the types of service vessel needed and suggest special equipment for access if that is possible. Most servicing and repair of devices will entail removal of the device from site, so may involve specification of bollard pull and winch capacities. Draught over the entrance to harbours may be an issue for bringing devices alongside quays.

Summary of Essential Skills Required. This section will describe the skill levels of management, supervision, technician/craftsmen and labour support. It should refer to any specific training or qualifications relating to vessel handling and offshore survival.

Summary of Principles & Good Practice in Inspection, Repair and Maintenance. This is intended to summarise the main elements of an Inspection/Repair/Maintenance (IRM) scheme indicating the application of Reliability considerations to setting and adjusting IRM levels.

Evaluating Unscheduled Maintenance Requirements. This section should cover the principles of reliability-centred maintenance and how such techniques as Failure Mode Effects Analysis can assist in the prediction (and hence the provision) for unscheduled maintenance, bearing in mind the limitations on weather windows through the winter months.

Records & Administration of Maintenance. This will explain the nature of recording and record-keeping for maintenance as outlined in good practice guides such as the ISO 9000 series. The emphasis here is on the planned aspects of the IRM scheme.

Maintenance and Spares Records and Data Collection. This section will emphasise the keeping of performance and usage records of small spares and consumable items so that an appropriate spares regime can be established which minimises spares holdings but includes arrangements with the supply chain to hold spares to given availability levels. Adaptive management is needed to adjust these in the light of experience with the devices.

Offshore Working. This section is intended to review the various methods required for establishing a safe working environment offshore for a variety of situations, in addition to specific guidelines on maintaining safe access/egress and dealing with emergency situations.

Hazard and Risk Assessment. This will consist mostly of standard Risk Assessments and risk management approaches but some non-routine Risk Assessments will be inevitable.

Competence of People. This documents the skill levels needed for the typical range of tasks and job roles necessary for O&M.

A proposed outline 'contents page' for this Standard/guideline is given below.

Contents of Operations and Maintenance Document

1. SCOPE
2. NORMATIVE REFERENCES
3. TERMS AND DEFINITIONS
4. SYMBOLS, UNITS AND ABBREVIATIONS
5. PLANNING & ENGINEERING FOR INSPECTION REPAIR & MAINTENANCE
 - Inspection
 - Repair
 - Procedures (including accessing devices)
 - Health & Safety (Permits to Access/Work)
 - Reliability Considerations
6. SERVICE VESSELS
 - Supply Vessels
 - Service Vessels
 - Crew boats
7. OFFSHORE WORKING
 - Moorings
 - Foundations
 - Submerging
 - Ballasting
 - Piling
 - Securing
 - Diving
 - Health, Safety and Emergencies
8. HAZARD IDENTIFICATION & RISK ASSESSMENT (HIRA)
 - Standard Risk Assessments
 - Permits to Access and Work
9. REVIEW OF METHODS (DIFFERENT TYPES OF DEVICE)
 - Floating
 - Bottom Founded – piled; - clump weights and ballast
 - Mid-water column
 - Structures
 - Deeper Water
10. COMPETENCE OF PEOPLE
 - Supervision
 - Technicians
 - Semi-skilled labour
11. DOCUMENTATION GUIDE
 - Maintenance & Inspection Programmes
 - Maintenance & Inspection Records
 - Spares Records
12. APPENDICES
 - List of relevant legislation
 - Typical Maintenance Programme Outline

4. Subsea Cable Lifecycle

Main sections of the draft will include the following:

Design of Subsea Power Cables. This section will address the basis of sizing conductors, selecting the screening and insulation materials, calculating fault levels, inclusion of fibres or instrument pairs, armouring. A typical design specification will be described in outline. Aspects of Health & Safety inherent in the design will also be defined.

Manufacture of Cables. This will outline the standards and techniques for manufacture indicating the rationale for choices to be made. A summary of factory testing will be included noting accepted industry standards.

Loading and Transportation. This will describe the approaches to loading either to reels or carousels or direct into vessel cable tanks. Optimum requirements will be outlined for storage of subsea cables depending on specific application and purpose of storage.

Offshore Cable Lay. This section is arguably the most important and can affect the cable life and performance adversely if mismanaged. The importance of detailed planning of routes to maximise protection of the cable as well as optimising cost aspects will be covered. The requirements of post lay inspection and remediation of any spanning or passage over potentially damaging seabed features will be summarised. The techniques and sequencing of infield cable lay to minimise damage risk during other construction activities will be emphasised. The methods for jointing and connection of cables to infield subsea hubs will be addressed.

Maintenance & Repair. This will include post-lay survey, subsequent surveys, routine testing of insulation, fibres and conductor integrity. The use of these surveys in establishing handover responsibilities between project stages will be discussed. Location of faults and retrieval methods for cables, depending on position of damage, will be covered. Jointing and replacement to seabed will also be described.

Decommissioning. An outline plan to enable cost estimation of decommissioning will be described as well as a suitable definition of procedures for decommissioning. Recovery of cable and the approaches to recycling will be included.

Appendices. Referring to existing codes and guidance e.g. The Crown Estates' guide on proximity to other offshore infrastructure will be included as appendices together with notes of relevant legislation.

A proposed outline 'contents page' for this Standard/guideline is given below.

Contents of Subsea Cable Lifecycle Document

1. SCOPE
2. NORMATIVE REFERENCES
3. TERMS AND DEFINITIONS
4. SYMBOLS, UNITS AND ABBREVIATIONS
5. DESIGN OF SUBSEA POWER CABLES
 - Calculations
 - Design Specifications
 - Health & Safety Considerations
6. MANUFACTURE OF CABLES
 - Standards
 - Techniques
 - Testing
7. LOADING AND TRANSPORTATION
 - Review of methods
 - Storage of cables
8. OFFSHORE CABLE LAY
 - Planning the Route
 - Route Survey
 - Vessel Selection
 - Cable Protection
 - Post-lay inspection and remediation
 - Infield cables
 - Jointing and Hubs
9. MAINTENANCE AND REPAIR
 - Inspection
 - Routine testing
 - Fault location
 - Retrieval and repair
10. DECOMMISSIONING
 - Decommissioning plan
 - Decommissioning procedure
 - Recovery and recycling
11. APPENDICES
 - List of relevant sections within existing codes, standards & guidelines
 - List of relevant legislation

5. Environmental Guidelines

Main sections of the draft will include highlighting the potential for the following, which could lead to adverse effects:

Wildlife Entanglement, Entrapment and Collision. The potential for damage and entrapment of wildlife (in particular, marine invertebrates, fish, mammals and birds) should be addressed in relation to structure, operation, season, and location. Potential effects or impacts may include entanglement or collision with any blades/rotors, jamming in joints, entrapment, etc.

Behavioural Changes in Wildlife (Including Displacement). Activities have the potential to affect the distribution of wildlife. The potential influence of activities and facilities upon wildlife, in particular those protected by European Directives and national legislation will be considered. Issues will include potential for displacement of species from breeding (e.g. nesting for birds, spawning for fish etc) and feeding area, disturbance to feeding activities.

Disturbance to Seabed Habitats. Anchoring, mooring/foundation installation, operation and maintenance equipment and other seabed disturbances may lead to disturbance/destruction of seabed habitats. Consideration will also be given to the potential disturbance of contaminated sediments.

Physical Disturbance to Water Masses. The scale and implications of changes to such factors as nutrients, temperature, light levels, turbidity (suspended sediments), surface waves and current patterns will be considered.

Ecological Energy Balances and Flows. Potential consequence of energy extraction and physical presence of devices in the sea will be addressed. These will include potential changes in vertical mixing, which may lead to changes in offshore and coastal habitats/features, with knock-on effects to biological communities.

Contamination of Seawater, Seabed and Wildlife (Including Fish Stocks). Contamination may result from effluent discharge, chemical discharge/leaching/leaks, oil discharge/leaks, sewage discharge, dumping of waste etc. The range of potential sources, planned or accidental, will be identified and considered.

Visual, Seascape and Landscape Impacts (Above Water). Devices visible from the coast and at sea may affect the seascape, landscape and visual qualities of particular views. Factors (within navigational requirements) that help structures blend in with, or enhance, the landscape are important. This can include colour, orientation, structural design, materials, etc. Visibility distances of lights will be considered together with compliance with GLA requirements/recommendations.

Submerged Landscape Impacts. Submerged facilities/devices have the potential to affect submerged landscapes so full consideration of this issue is to be included.

Navigation / Sea User Interference. The presence of devices and their mooring systems has the potential to interfere with vessels and other sea users. Coverage will include areas over which particular care is needed, e.g.: navigation; MOD interests; cables and pipelines; sea disposal sites; fisheries; recreational and tourism interests etc.

A proposed outline 'contents page' for this Standard/guideline is given below.

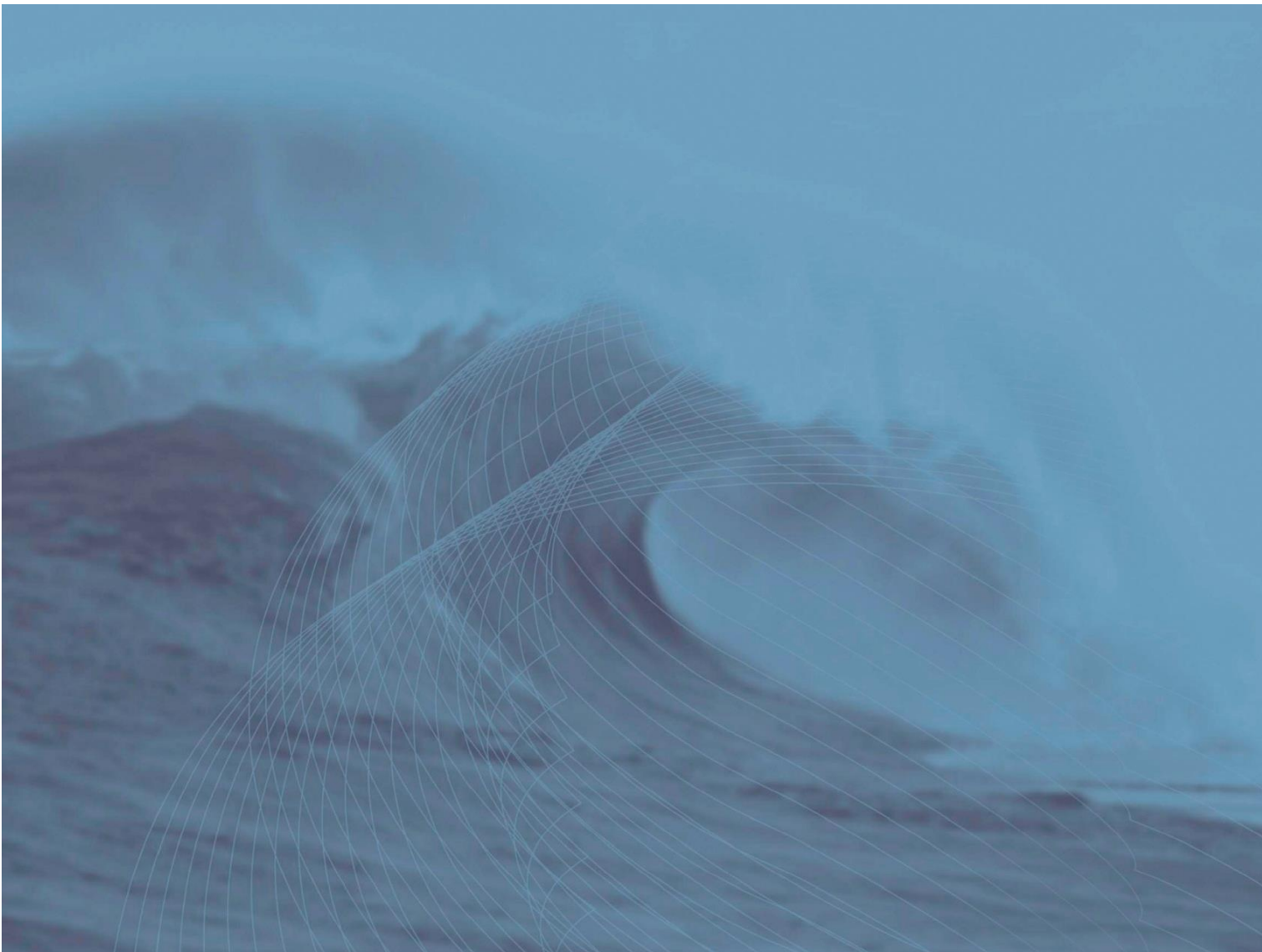
Contents of Environmental Guidelines Document

1. SCOPE
2. NORMATIVE REFERENCES
3. TERMS AND DEFINITIONS
4. SYMBOLS, UNITS AND ABBREVIATIONS
5. WILDLIFE ENTANGLEMENT & COLLISION
 - Marine Mammals
 - Fish
 - Marine Birds
6. BEHAVIOURAL CHANGES IN WILDLIFE
 - Distribution of Wildlife
 - Displacement
 - European Directives
7. DISTURBANCE TO SEABED HABITATS
 - Mooring/foundation Installation
 - Operation & Maintenance
8. PHYSICAL DISTURBANCE TO WATER MASSES
 - Changes to nutrients, temperature, light level
 - Surface Waves
 - Currents
9. ECOLOGICAL ENERGY BALANCE AND FLOW
 - Physical Presence of Devices
 - Effect of Energy Extraction
10. CONTAMINATION OF SEAWATER, SEABED, AND WILDLIFE
 - Effect of Effluent, Chemical, Oil, Sewage Discharge
 - Planned Discharge
 - Accidental Discharge
11. VISUAL, SEASCAPE, AND LANDSCAPE IMPACTS
 - Visible Structural Dimensions
 - Colour
 - Lighting and Other Navigational Markings
12. SUBMERGED LANDSCAPE IMPACTS
 - ??
13. NAVIGATION/SEA USER INTERFERENCE
 - Key Sea Users
 - Key Impacts
14. APPENDICES
 - List of relevant existing guidelines
 - List of relevant legislation

6. Execution of the Work

The proposed method to develop the new standards/guidelines is to appoint an entity (tbc) to manage the administrative function and act as the 'holder' of the documentation. The outline stages in the development are proposed to be as follows:

1. Prepare initial draft of each document, including reference to existing codes and standards and largely following the structure suggested in BS-0 with mandatory use of a hired professional author.
2. Identify stakeholders.
3. Circulate draft to key stakeholders for review.
4. Incorporate comments.
5. Hold workshop to stimulate discussion, raise topics / issues and suggested resolutions / methods involving as many stakeholders as possible (consider holding workshops in different locations). Format of these workshops would be facilitated group reviews / discussions on each document with the author present.
6. Re-issue as a consultative document, calling for review and comments
7. Professional Editing by BSI Group.
8. Make documents available at appropriately designed website



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