

**SCOPE FOR STANDARD ON
MANUFACTURE AND FACTORY TESTING OF MARINE ENERGY DEVICES**

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1 Introduction

Marine generator devices including wave and tidal power generators are currently being developed and starting to be deployed around the world. The UK is leading the world in the area of marine renewable devices and standards developed for this industry in the UK will reinforce this position as a world leader.

The IEC, the global body for electrical energy standards, has formed a new Technical Committee on Marine Energy – Wave and Tidal Energy Converters (TC114), to take forward the development of these standards. The British Standards Institute has put its self forward to the secretariat for this TC and a UK “Mirror” committee will be formed.

Currently in the UK there exists an ad-hoc working group (AHWG) as a pre-cursor to the “Mirror” Committee that is overseeing the production of draft standards that will either national standards or guidelines or be submitted to the IEC. These standards cover individual device design and validation and whole projects, the breakdown of each of these areas is shown in Table 1. The standard to which this ITT refers is “Manufacture and factory testing” in Table 1.

1. Device Design	2. Device Validation	3. Sites and Projects
Grid interface	Wave Device Performance Testing	Wave Resource Assessment
Basis of design (devices)	Tidal Device Performance Testing	Tidal Resource Assessment
Manufacture and factory testing	Outline Certification scheme	Project development
Reliability, survivability and maintainability	Environmental Performance Guideline	H & S Statement
	Tank testing	

Table 1: Standards under development

This document provides a scope for a Manufacture and factory testing standard for marine energy devices. It is not intended to be definitive but provides a framework for development.

2 Marine Standards

Across the energy industry, technical standards for generation systems are commonplace. Standards are used to confirm that a product is right for the job, that it will perform as well as claimed, or that risks have been minimised. Engineers use standards to make products of a high technical quality, and investors rely on standards to ensure technical risks are controlled. Knowing a device is built to a certain standard provides an investor with the knowledge required to make a decision without having to perform due diligence in the area relating to the standard.

Standards already exist for several renewable energy technologies, including wind turbines and photovoltaic (PV) cells. But currently there are few dedicated standards for marine energy systems. Consequently, technology developers are exploring how standards that exist in other industry sectors can be applied to their designs – a pragmatic approach to make best use of available knowledge.

Due to similarities in their operating environments, standards for the offshore oil/gas and shipping sectors are relevant to marine energy systems. However, it is generally not obvious which particular standards are most appropriate, or to what extent the advice contained within the standards is directly applicable to marine energy systems. Expert help is needed to overcome these barriers in the form of dedicated marine standards.

3 Manufacture and Factory Testing Scope

This scope outlines the principal topics to be included in the draft standard. It does not claim to be exhaustive - additions and changes will be discussed in Peer Reviews.

The Manufacture and factory testing standard must work closely with several standards listed in Table 1.

Initially the author should perform a review of the work done in other IEC technical committees, notably TC88 (Wind Turbines) and the Carbon Trust / DNV Guidelines referenced in Section 4 to check for synergies

Envisaged contents of the Manufacture and factory testing standard are listed below. The expert author is encouraged to constructively review and modify this list in line with his/her professional experience.

Overview

This standard shall cover all marine energy devices, i.e. both tidal stream converters and wave energy converters.

Manufacturing scope is envisaged to include the manufacture and assembly of the complete marine energy device, including its structure and sub-assemblies and their integration into the energy recovery device.

Factory testing scope is envisaged to include all functional and performance tests and quality controls within the device manufacturer / assembler.

Testing and certification issues within the supply chain of the device are outside the scope of this standard except that assurance of their accomplishment shall be obtained.

Manufacture scope

- Quality Management System
- Liaison with design function
- Adherence to design specifications in manufacture
- Management of design variations in manufacture
- Manufacture to appropriate National and Industry standards
- Manufacture to appropriate quality and environmental standards
- Structures
 - Integrity
 - Steel
 - Concrete
 - Other
 - Joint details
- Sub-assemblies, Systems and Equipment
 - Power take-off (PTO)
 - Hydraulic
 - Piping
 - Machines
 - Pressure vessels (including accumulators) and tanks
 - Electrical
 - Instrumentation
- Consumable and bulk items
- Materials for marine environments
- Finishes (coatings, paints etc) for marine environments
- Environmental impacts in manufacturing

Factory Testing scope

- Dimensional control
- Inspection function
- Testing records through supply chain

- Material certificates
- Welding / bonding certificates
- Trial fit-up at works
- Functional testing
- Performance testing

4 Reference(s)

- Guidelines on design and operation of wave energy converters, May 2005 – (210 pages)

This work was commissioned by the Carbon Trust and completed by DNV in May 2005 to produce a guideline for the design and operation of wave energy converters. This guideline is available for free download on both the Carbon Trust and DNV websites. Whilst this guideline was produced specifically for wave energy converters it also has some applicability to tidal stream converters.