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BSI Standards Publication

# Marine energy — Wave, tidal and other water current converters

## Part 201: Tidal energy resource assessment and characterization

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## National foreword

This Published Document is the UK implementation of IEC/TS 62600-201: 2015.

The UK participation in its preparation was entrusted to Technical Committee PEL/114, Marine energy — Wave, tidal and other water current converters.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.


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# TECHNICAL SPECIFICATION

colour inside

## Marine energy – Wave, tidal and other water current converters – Part 201: Tidal energy resource assessment and characterization

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# MARINE ENERGY – WAVE, TIDAL AND OTHER WATER CURRENT CONVERTERS –

## Part 201: Tidal energy resource assessment and characterization

## FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62600-201, which is a technical specification, has been prepared by IEC technical committee 114: Marine energy – Wave, tidal and other water current converters.

The text of this technical specification is based on the following documents:

| Enquiry draft | Report on voting |
|---|---|
| 114/142/DTS | 114/151A/RVC |

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62600 series, published under the general title *Marine energy – Wave, tidal and other water current converters*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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# INTRODUCTION

This Technical Specification is for use by appropriately qualified and competent persons. The development of the tidal power industry is at an early stage and the significance of particular tidal energy resource characteristics is not well understood. This Technical Specification is intended to be updated as understanding of the resource and its response to power extraction becomes better understood. It is noted that it is presently particularly difficult to derive the uncertainty (within specified confidence limits) of the resource, given lack of field and model data for a statistically significant number of sites.

The purpose of this Technical Specification is to provide a uniform methodology that will ensure consistency and accuracy in the estimation, measurement, characterization and analysis of the theoretical tidal current resource at sites that could be suitable for the installation of an array of Tidal Energy Converters (TECs), together with defining a standardised methodology with which this resource can be described and reported. Application of the estimation, measurement and analysis techniques recommended in this Technical Specification will ensure that resource assessment is undertaken in a consistent and accurate manner. This Technical Specification presents techniques that are expected to provide fair and suitably accurate results that can be replicated by others.

The overall goal of the methodology is to enable calculation of the Annual Energy Production (AEP) for the proposed array of TECs at each TEC location in conjunction with IEC 62600-200.

In this Technical Specification, the theoretical tidal energy resource (undisturbed or disturbed by power extraction) is defined as the velocity probability distribution $f(U_i)$. For projects over c. 10 MW (circa 10 MW), the velocity probability distribution is calculated using hydrodynamic models that have been appropriately verified using measured data. The methodology for measuring the required data is also defined. For individual TECs within small projects of less than c. 10 MW, an alternative method which uses measured data at each TEC location may also be used to define the resource.

This Technical Specification describes only the aspects of the resource required to calculate AEP; e.g., it does not describe aspects of the resource required to evaluate design loads or to satisfy environmental regulations. Furthermore, this Technical Specification is not intended to cover every eventuality that may be relevant for any particular project. Therefore, this Technical Specification assumes that the user has access to, and reviews, other relevant IEC documentation before undertaking work (e.g., surveys and modelling) which could also satisfy other requirements.

# MARINE ENERGY – WAVE, TIDAL AND OTHER WATER CURRENT CONVERTERS –

# Part 201: Tidal energy resource assessment and characterization

## 1 Scope

This part of IEC 62600 establishes a system for analysing and reporting, through estimation or direct measurement, the theoretical tidal current energy resource in oceanic areas including estuaries (to the limit of tidal influence) that may be suitable for the installation of arrays of TECs.

It is intended to be applied at various stages of project lifecycle to provide suitably accurate estimates of the tidal resource to enable the arrays' projected annual energy production to be calculated at each TEC location in conjunction with IEC 62600-200.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61400-12-1, *Wind turbines – Part 12-1: Power performance measurements of electricity producing wind turbines*

IEC TS 62600-1, *Marine energy – Wave, tidal and other water current converters – Part 1: Terminology*

IEC TS 62600-200, *Marine energy – Wave, tidal and other water current converters – Part 200: Electricity producing tidal energy converters – Power performance assessment*

IHO (International Hydrographic Organisation), 2008, *Standards for Hydrographic Surveys. Special Publication No. 44. 5th Edition*

ICES, 2006, *Guidelines for Multibeam Echosounder Data*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 62600-1 apply.

## 4 Symbols, units and abbreviations

### 4.1 Symbols and units

$f(U_i)$ Time occurrence likelihood of a velocity in each magnitude bin (%)

$f(U_i, \theta_k)$ Time occurrence likelihood of a velocity in each magnitude and direction bin (%)

$I$ Turbulence intensity

$i$ Index for velocity magnitude bin numbers