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Marine energy – Wave, tidal and other water current converters – Part 101: Wave energy resource assessment and characterization

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

Part 101: Wave energy resource assessment and characterization

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC TS 62600-101:2015. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC TS 62600-101 has been prepared by IEC technical committee 114: Marine energy – Wave, tidal and other water current converters. It is a Technical Specification.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Incorporation of annual energy production (AEP), formerly detailed in IEC TS 62600-102, as Annex A in this document and in IEC TS 62600-100.
b) Modification to the list of terms and abbreviations

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
114/539/DTS	114/555/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- revised.

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INTRODUCTION

This document provides a uniform methodology that will ensure consistency, accuracy and reproducibility in the estimation, measurement, and analysis of the wave energy resource at sites that could be suitable for the installation of Wave Energy Converters (WECs), together with defining a standardised methodology with which this resource can be described. This document, when used in conjunction with other Technical Specifications in this series (IEC TS 62600), is intended for several types of users, including but not limited to the following:

- Project developers and investors to accurately and fairly estimate resource availability and mean annual energy production at a potential project site for income or return on investment calculations.
- Device developers striving to accurately estimate and report potential device performance, or recommend a particular device design to a project developer, given specific site conditions.
- Utilities and owners or operators in calculating reliability and predictability of power supply, as well as return on investment.
- Policy-makers, planners, and regulators who are concerned with accurately planning usage of seascape among stakeholders, optimisation of resources, and power supply issues.
- Consultants involved in producing resource data and conducting due diligence studies, who require a standard, compatible, and readable data format.

Application by all parties of the methodologies recommended in this document will ensure that continuing resource assessment of potential development sites is undertaken in a consistent and accurate manner. This document presents techniques that are expected to provide fair and suitably accurate results that can be replicated by others.

The wave energy resource is primarily defined using hydrodynamic models that are successfully validated against measured data. This document deals directly with the theoretical resource and the main focus of the defined methodology is to generate the resource information required to estimate annual energy production. ~~Practical energy production can then be estimated in conjunction with other Technical Specifications in this series (IEC TS 62600), and by considering available technology and external constraints.~~ The capture width of a WEC is estimated using the methodology presented in IEC TS 62600-100. Then, using the capture width information, in conjunction with the resource information generated with the methodology described in this document, the methodology in Annex A is used to calculate annual energy production. A framework for estimating the uncertainty of the wave energy resource estimates is also provided in Annex B.

~~This Technical Specification provides guidance relating to the measurement, modelling, analysis and reporting of the wave energy resource, and the linkages between these activities. A framework for estimating the uncertainty of the wave energy resource estimates is also provided. Application by all parties of the methodologies recommended in this document will ensure that continuing resource assessment of potential development sites 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 development of the wave power industry is at an early stage and the significance of particular wave energy resource characteristics is poorly understood. Because of this, the present document is designated as a Technical Specification and will be subject to change as more data is collected and experience with wave energy ~~Converters~~ conversion develops.

~~This Technical Specification, when used in conjunction with other Technical Specifications in this series (IEC TS 62600), is intended for several types of users, including but not limited to the following:~~

~~• Project developers – income, return on investment~~

~~• Device developers – performance of device~~

- ~~Utilities/investors – reliability/predictability of supply, return on investment,~~
- ~~Policy-makers/Planners – usage of seascape, optimisation of resource, power supply issues~~
- ~~Consultants to produce resource data/due diligence – compatible/readable data format~~

~~The report required by this Technical Specification is highly technical and may be difficult to understand for some intended users. It is recommended that a short (2 to 4 pages) summary of the key findings of the resource assessment is also produced, converting some of the more technical language into information that could be readily understood by a non-technical user.~~

An essential element for any published Technical Specification or International Standard is to allow an opportunity to provide feedback on its contents to the appropriate TC 114 Working Group. TC 114 utilizes a standard methodology to allow this. To submit feedback such as proposed changes, corrections and/or improvements to this document, please send an email to the TC 114 Chair using the Contact TC 114 Officers feature on the IEC TC 114 Dashboard, accessible at www.iec.ch/tc114. On the right side of the Dashboard under Further information select the link to contact the TC 114 Officers. On the subsequent page find and select the Send Email link for the Chair to access the email tool.

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

Part 101: Wave energy resource assessment and characterization

1 Scope

This part of IEC 62600 establishes a system for estimating, analysing and reporting the wave energy resource at sites potentially suitable for the installation of Wave Energy Converters (WECs). This document is to be applied at all stages of site assessment, from initial investigations to detailed project design. This document is to be applied in conjunction with the IEC Technical Specification on WEC performance (IEC TS 62600-100) to estimate the mean annual energy production of a WEC or WEC array ~~to be calculated~~ as described in the methodology in Annex A. This document is not intended for estimation of extreme wave conditions.

The wave energy resource is primarily defined using hydrodynamic models that are successfully validated against measurements. The framework and methodologies prescribed in this document are intended to ensure that only adequate models are used, and that they are applied in an appropriate manner to ensure confidence and consistency in the reported results. Moreover, the document prescribes methods for analysing metocean data (including the data generated by modelling) in order to properly quantify and characterize the temporal and spatial attributes of the wave energy resource, and for reporting the results of a resource assessment in a comprehensive and consistent manner.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TS 62600-100:—, *Marine energy – Wave, tidal and other water current converters – Part 100: Electricity producing wave energy converters – Power performance assessment*[1]

IEC/ISO~~/IEC~~ Guide 98-3:2008, *Guide to the expression of uncertainty of measurement*

~~ASME 20-2009, *Standard for Verification and Validation in Computational Fluid Dynamics and Heat Transfer*~~

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

[1] Under preparation. Stage at the time of publication: IEC/DTS 62600-100:2024.

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TECHNICAL SPECIFICATION

Marine energy – Wave, tidal and other water current converters – Part 101: Wave energy resource assessment and characterization



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FOREWORD

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- Utilities and owners or operators in calculating reliability and predictability of power supply, as well as return on investment.
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The wave energy resource is primarily defined using hydrodynamic models that are successfully validated against measured data. This document deals directly with the theoretical resource and the main focus of the defined methodology is to generate the resource information required to estimate annual energy production. The capture width of a WEC is estimated using the methodology presented in IEC TS 62600-100. Then, using the capture width information, in conjunction with the resource information generated with the methodology described in this document, the methodology in Annex A is used to calculate annual energy production. A framework for estimating the uncertainty of the wave energy resource estimates is also provided in Annex B.

The development of the wave power industry is at an early stage and the significance of particular wave energy resource characteristics is poorly understood. Because of this, the present document is designated as a Technical Specification and will be subject to change as more data is collected and experience with wave energy conversion develops.

An essential element for any published Technical Specification or International Standard is to allow an opportunity to provide feedback on its contents to the appropriate TC 114 Working Group. TC 114 utilizes a standard methodology to allow this. To submit feedback such as proposed changes, corrections and/or improvements to this document, please send an email to the TC 114 Chair using the Contact TC 114 Officers feature on the IEC TC 114 Dashboard, accessible at www.iec.ch/tc114. On the right side of the Dashboard under Further information select the link to contact the TC 114 Officers. On the subsequent page find and select the Send Email link for the Chair to access the email tool.

Complete all the required elements within the email pop-up. For the Subject field please include the document title and edition you are providing feedback for (ex: Feedback for TS 62600-1 ED2). In the Message field, include text which summarizes your feedback and note if further information can be made available (note attachments are not allowed). The Chair may request added information as needed before forwarding the submission to the remaining TC 114 Officers for review and then to the appropriate Working Group for their consideration.

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

Part 101: Wave energy resource assessment and characterization

1 Scope

This part of IEC 62600 establishes a system for estimating, analysing and reporting the wave energy resource at sites potentially suitable for the installation of Wave Energy Converters (WECs). This document is to be applied at all stages of site assessment, from initial investigations to detailed project design. This document is to be applied in conjunction with the IEC Technical Specification on WEC performance (IEC TS 62600-100) to estimate the mean annual energy production of a WEC or WEC array as described in the methodology in Annex A. This document is not intended for estimation of extreme wave conditions.

The wave energy resource is primarily defined using hydrodynamic models that are successfully validated against measurements. The framework and methodologies prescribed in this document are intended to ensure that only adequate models are used, and that they are applied in an appropriate manner to ensure confidence and consistency in the reported results. Moreover, the document prescribes methods for analysing metocean data (including the data generated by modelling) in order to properly quantify and characterize the temporal and spatial attributes of the wave energy resource, and for reporting the results of a resource assessment in a comprehensive and consistent manner.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TS 62600-100:—, *Marine energy – Wave, tidal and other water current converters – Part 100: Electricity producing wave energy converters – Power performance assessment*[1]

IEC/ISO Guide 98-3:2008, *Guide to the expression of uncertainty of measurement*

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

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1 Under preparation. Stage at the time of publication: IEC/DTS 62600-100:2024.