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Recommendations for a modular and cross-cutting Power Take-Off for wave energy direct drive linear solutions

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Foreword

CWA 50271:2021 has been developed in accordance with the CEN-CENELEC Guide 29 “CEN/CENELEC Workshop Agreements – A rapid prototyping to standardization” and with the relevant provisions of CEN/CENELEC Internal Regulations – Part 2. It was approved by a Workshop of representatives of interested parties on 2021-02-10, the constitution of which was supported by CEN-CENELEC following the public call for participation made on 2020-06-10. However, this CEN-CENELEC Workshop Agreement does not necessarily include all relevant stakeholders.

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Introduction

The EU's Energy Roadmap states that renewable energy should make up at least 64 % - and up to 97 % - of electricity consumed by 2050. Wave and tidal energy remain an untapped source of power, which could prove critical to enabling Europe to meet this commitment. Furthermore, according to the "Strategic Research and Innovation Agenda for Ocean Energy" published in May 2020 by the European Technology & Innovation Platform for Ocean Energy (H2020 grant agreement 826033) one of the challenge areas identified for Wave Energy Technology is the design and validation of ocean energy devices, in particular, the improvement and demonstration of PTO and control systems where one of the expected impacts is aligned with the purpose of this document: *"Convergence (standardization) and simplification of designs to allow a reduction in maintenance costs".*

Currently each original WEC equipment manufacturer offers its own solution for the wave energy conversion technology, pursuing the development of bespoke technology without a common approach or objective not only limits the utility of the end product but also multiplies the development time and costs. Wave energy convergence represent an approach to a more sustainable and integrated industrial economy which identifies business opportunities to enable industrial processes and mass scale production.

Enabling this convergence requires the identification of the core elements shared in common between most of the WEC technologies being developed in the recent years, so synergies can be found between them and common industrial solutions can be proposed, focusing the R&D efforts where relevant for each developer, channeling the innovation present within any and all of the different WEC projects or developments (best value for money) while also reducing risk associated with the innovation process. For this to happen however, the wave energy sector needs to achieve economies of scale and have access to reliable technology and a dedicated supply chain.

This document has been developed in the frame of the project H2020 SEA TITAN (Grant Agreement No. 764014).

1 Scope

This CEN Workshop Agreement (CWA) document provides recommendations for good practice implementation of Modular and Crosscutting Power Take Offs (PTO) for wave energy linear direct drive technologies, in addition, a switched reluctance case study will be presented. Any wave energy technology developer or associated stakeholders should find here guidance and recommendations to consider and adopt a Modular and Cross-cutting linear direct drive PTO technology.

Consensus on the core elements for Modular and Cross-cutting PTO technology is provided to enable its identification, definition and design recommendations or guidelines, including mechanical, electric, power electronics and control elements. Specifically, this CWA sets out the following:

1) Core elements for a cross-cutting and modular PTO.

2) Relevant interfaces for modular and cross-cutting PTO implementation.

3) Annex: SEA TITAN linear switched reluctance PTO.

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 62600-1, *Marine energy — Wave, tidal and other water current converters — Part 1: Vocabulary*

IEC/TS 62600-2, *Marine energy — Wave, tidal and other water current converters — Part 2: Marine energy systems — Design requirements*

IEC/TS 62600-100:2012, *Marine energy — Wave, tidal and other water current converters — Part 100: Electricity producing wave energy converters — Power performance assessment*

3 Terms, definitions and abbreviation

3.1 Terms and definitions

For the purpose of this document, the following terms, definitions and abbreviations apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
prime mover
physical component that acts as the interface between the marine resource and the energy converter from which energy is capture

Note 1 to entry: For wave energy converters the prime mover may be a heaving buoy, hinged flap, an OWC runner, etc.

[SOURCE: IEC TS 62600-1:2012]