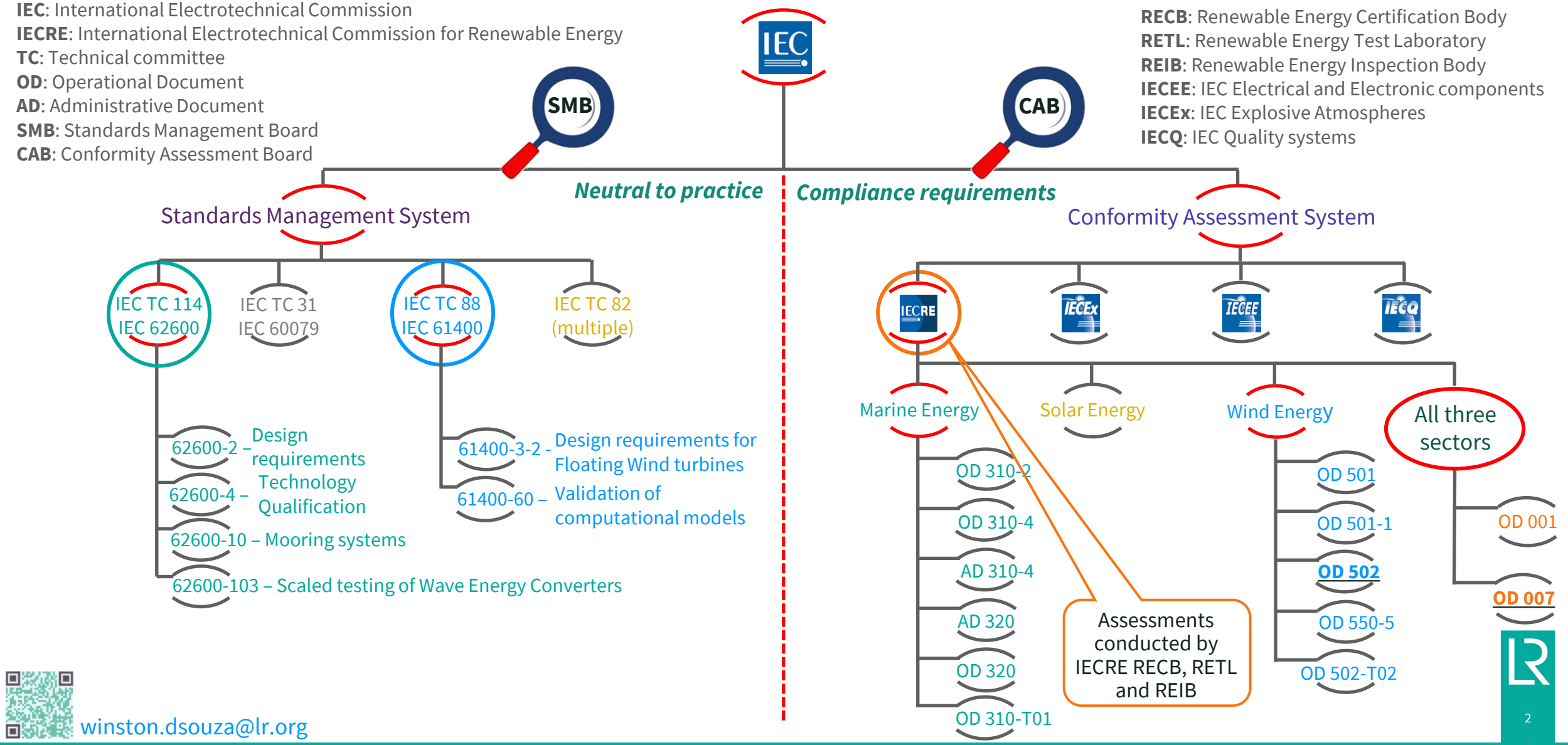
Standards and Certification of Marine Energy Conversion Systems

IEC Standards and Conformity Assessment Systems

IEC: International Electrotechnical Commission
IECRE: International Electrotechnical Commission for Renewable Energy
TC: Technical committee
OD: Operational Document
AD: Administrative Document
SMB: Standards Management Board
CAB: Conformity Assessment Board

RECB: Renewable Energy Certification Body
RETL: Renewable Energy Test Laboratory
REIB: Renewable Energy Inspection Body
IECEE: IEC Electrical and Electronic components
IECEx: IEC Explosive Atmospheres
IECQ: IEC Quality systems



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IEC Standards (Marine energy)

November 2025-onwards

IEC TC 114 – Suite of Technical Specifications

Generic	Wave	Tidal	Rivers	OTEC
Terminology now Available in the Electropedia Section 417 https://www.electropedia.org/				
-2 Design Requirements	-100 Power Performance	-200 Power Performance	-300 Power Performance	-20 OTEC Design Assessment
-3 Loads Measurement	-101 Resource Assessment	-201 Resource Assessment	-301 Resource Assessment	-21 OTEC Power Performance
-4 Technology Qualification	-103 Scale Testing	-202 Scale Testing		-22 OTEC Resource Assessment
-10 Moorings	-104 Small/Tiny WECs R&D (new project 2025)			
-30 Power Quality				
-40 Acoustic Measurement				
-41 Biofouling				
-50 Turbulence				

Technical Specifications (TS) share the same normative nature and consensus-based development as Standards, but may not have completed all the approval stages or reached full consensus

Published

Under Development

Proposed

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IECRE Conformity Assessment System

IEC Conformity Assessment Board (CAB)
Oversees IEC Conformity Assessment Systems, eg IECEE, IECEx, IECQ, IECRE

IECRE management committe (REMC)
Management and overall operational respo ibility o ECRE

Member bodies (countries)
REMC Officers + Executive Secretary, Chairs of committees, Convenors of WGs/SGs/TFs, IEC Secretary-General

Jonathan Colby
Chair

IECRE Secretariat
Technical support and administration

Wolfram Zeitz
Secretary

Gabriel Alsenas
Treasurer

Marine energy
Sector working group (ME-SWG)

PV solar energy
Sector working group (PV-SWG)

Wind energy
Sector working group (WE-SWG)

Joint working forum (JWF)

Stakeholder groups (SGs)

Working groups (WGs)

Task forces (TFs)

2026-onwards

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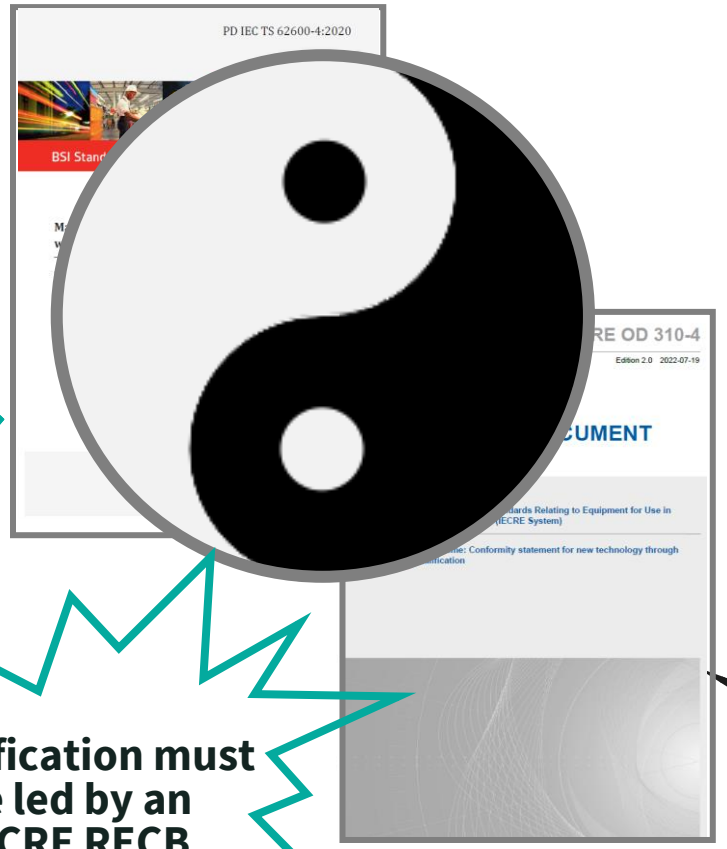
IECRE Certification requirements

Verification

Certification

Validation

Confirmation process through design analysis to ensure the product meets the stated standards/codes (e.g. design appraisal)



Confirmation through testing to ensure the product meets the stated standards in an operating environment (e.g. type testing)

Scope of IEC 62600-4

Certification must be led by an IECRE RECB

Scope of IECRE OD 310-4

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IECRE Assessment entities

Testing

RETL Renewable Energy Test Laboratory

EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD

EMEC is the only IECRE RETL with a scope for Tidal Energy technologies

- Issues Test Reports in accordance with the requirements of IEC standards

RECTF Renewable Energy Customer Test Facility

Marine Energy sector does not have any RECTF

- Issues Test Reports in accordance with the requirements of IEC standards

REIB Renewable Energy Inspection body

Marine Energy sector does not have any REIB

- Issues Inspection Reports in accordance with tests witnessed

Certification

RECB Renewable Energy Certification Body

Lloyd's Register is the only IECRE RECB with a scope for Wind and Marine Energy technologies

- Issues Feasibility and Conformity Statements on behalf of the IECRE to confirm conformity to IEC TS 62600 standard
- Issues IECRE Certificates

https://certificates.iecre.org

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Why the IECRE RECB and not any CB certification

1. It is a single, globally accepted certification system

2. Consists of structured modular assessments based on consensus-based scope of work

3. Accepted by most national/local authorities or other bodies

4. Adopts globally accepted international standards as the basis for assessments

5. Implements a mutual recognition of deliverables between certification bodies and test labs that are part of the IECRE system

6. Aims to provide a transparent understanding of reports, statements and certificates from suppliers to end users and other stakeholders (e.g. financiers, insurance bodies, etc.) seeking information on the assessed technology

7. All IECRE deliverables are posted on the IECRE certificates site to enhance credibility

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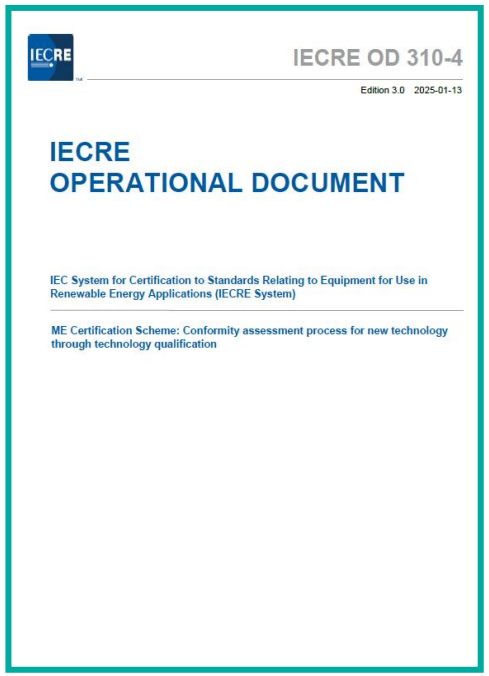
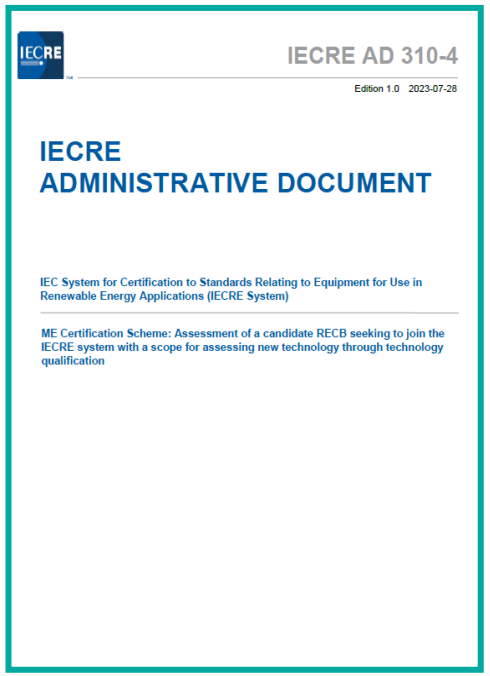
IECRE documents (inputs)

Types of documents practiced within the IECRE conformity assessment system:

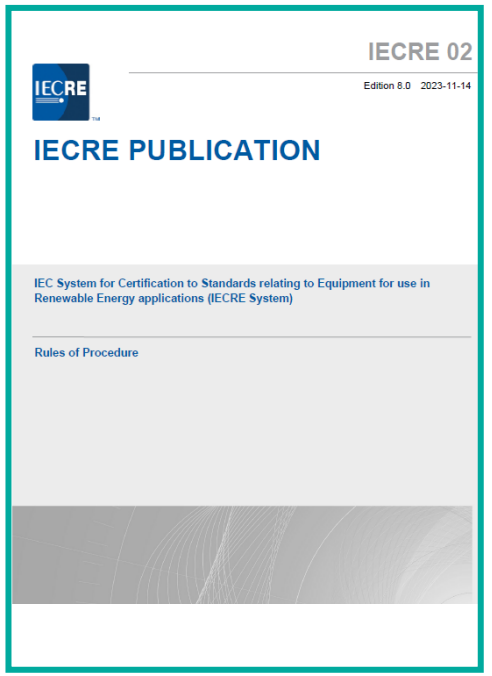
Operational documents



Administrative documents



IECRE Publication



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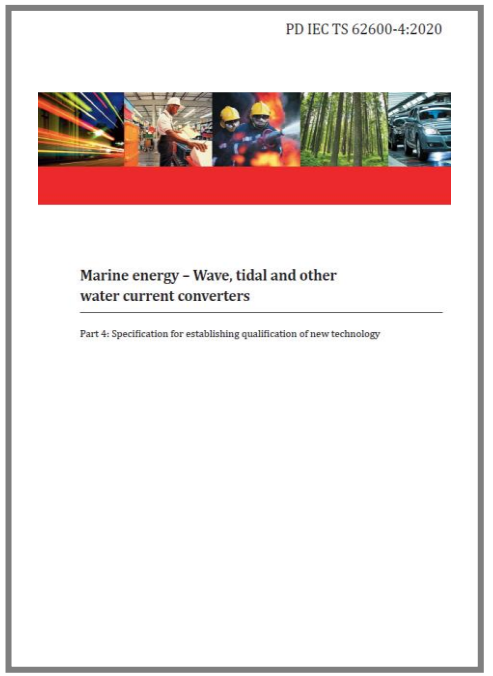
International Standards



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IECRE deliverables (outputs)

Test /Inspection Reports: Based on tests conducted against IEC standards or IECRE OD

Feasibility Statement: Based on IECRE OD. It is issued for Marine energy conversion systems only

Conformity Statement: Based upon successful completion of a specific scope of work against the requirements of an IECRE OD within a certification process

Certificates: Based on the successful completion of the full set of requirements against an IECRE OD

Test Report issued under the responsibility of:

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

TEST REPORT

IEC/TS 62600-200 Ed. 1.0

Marine energy – Wave, tidal and other water current converters – Part 200: Electricity producing tidal energy converters – Power performance assessment

IECRE Report Number.....:	IECRE.ME.TR.TPP.21-00001-R0
RETL internal Report Number..:	REP844
Date of issue.....:	02/04/2021
Total number of pages .....:	150
RE Testing Laboratory:	EMEC
Testing location/ address	Roosevelt Island Tidal Energy site (RITE), East River, East Channel, New York, US.
Applicant's name .....:	Verdant Power, Inc.
Address.....:	Roosevelt Island, New York, NY, USA
Test item description.....:	Tidal Energy Converter (TEC) consisting of a TriFrame mount rigidly fixed to the bottom with three 3-bladed horizontal axis tidal turbines.
Manufacturer .....:	Verdant Power, Inc.
Model/Type reference .....:	Gen5d
Ratings.....:	35 kW per turbine (3 turbines)

	Printed name/function	Signature
Tested by (name, function, signature) .....:	Cristina M Lozano	Cristina Lozano
Approved by (name, function, signature) .....:	Jonathan Linsday	Jonathan Lindsay

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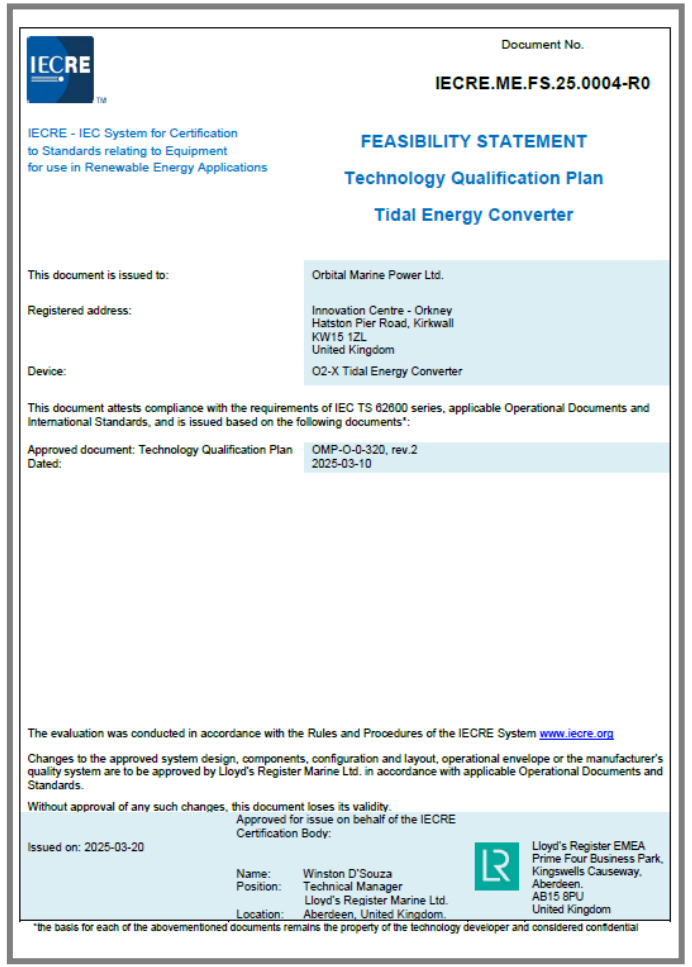

Document No.

IECRE.ME.FS.25.0004-R0

IECRE - IEC System for Certification to Standards relating to Equipment for use in Renewable Energy Applications

FEASIBILITY STATEMENT

Technology Qualification Plan

Tidal Energy Converter

This document is issued to:	Orbital Marine Power Ltd.
Registered address:	Innovation Centre - Orkney Hatston Pier Road, Kirkwall KW15 1ZL United Kingdom
Device:	O2-X Tidal Energy Converter

This document attests compliance with the requirements of IEC TS 62600 series, applicable Operational Documents and International Standards, and is issued based on the following documents*:

Approved document: Technology Qualification Plan Dated:	OMP-O-0-320, rev.2 2025-03-10

The evaluation was conducted in accordance with the Rules and Procedures of the IECRE System www.iecre.org

Changes to the approved system design, components, configuration and layout, operational envelope or the manufacturer's quality system are to be approved by Lloyd's Register Marine Ltd. in accordance with applicable Operational Documents and Standards.

Without approval of any such changes, this document loses its validity.

Issued on: 2025-03-20

Approved for issue on behalf of the IECRE Certification Body:

Name: Winston D'Souza
Position: Technical Manager
Lloyd's Register Marine Ltd.
Location: Aberdeen, United Kingdom.

Lloyd's Register EMEA
Prime Four Business Park,
Kingswells Causeway,
Aberdeen,
AB15 8PU
United Kingdom

*the basis for each of the abovementioned documents remains the property of the technology developer and considered confidential

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IECRE Certification process for MECS

TRL 3 – TRL 6

Technology Qualification OD 310-4

TRL 7 – TRL 8

Prototype Certification OD 320

Mass Production

Component Certification OD 330

Type Certification OD 340

Deployment

Project Certification OD 350

Normative documents:
OD 310-4: Technology Qualification for MECS
OD 320: Prototype certification
OD 330: Component certification
OD 340: Type certification
OD 350: Project certification

☐ **Published**

☐ *In development*

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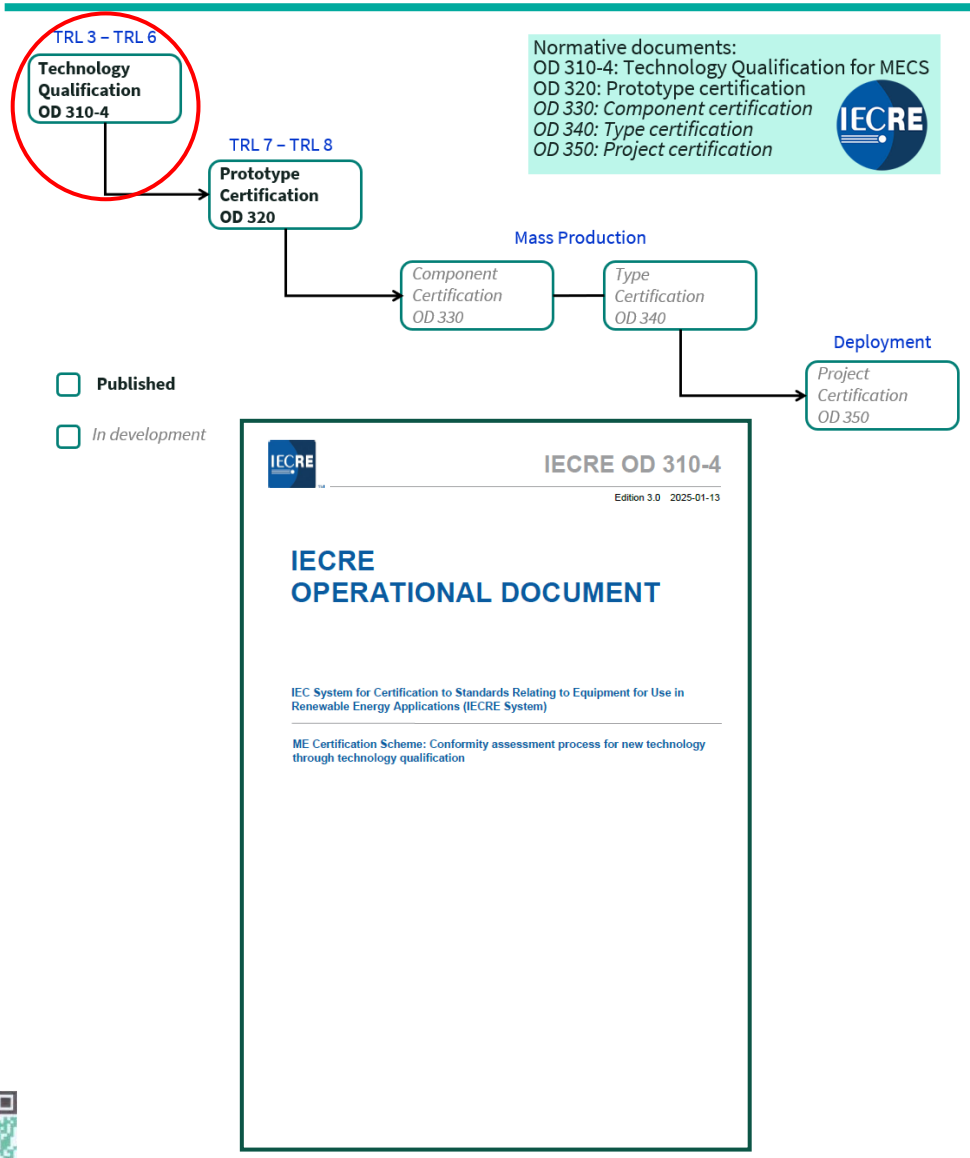
IECRE OD 310-4 (till issuance of Feasibility Statement)



<u>OD 310-4: Technology Qualification for Marine Energy Conversion Systems</u>

- Definition of the technology
  - System level
  - Subsystem level
- Technology assessment
  - Technology readiness levels (TRL)
  - Integration readiness levels (IRL)
  - *Modified* technology readiness levels (*m*TRL)
- Risk assessment
- System assessment
- Technology appraisal report (TAR) *–issued by RECB*
- Technology Qualification Plan (TQP) *–created by developer*
- TQP evaluated and accepted by RECB

Deliverable: IECRE Feasibility Statement for TQ

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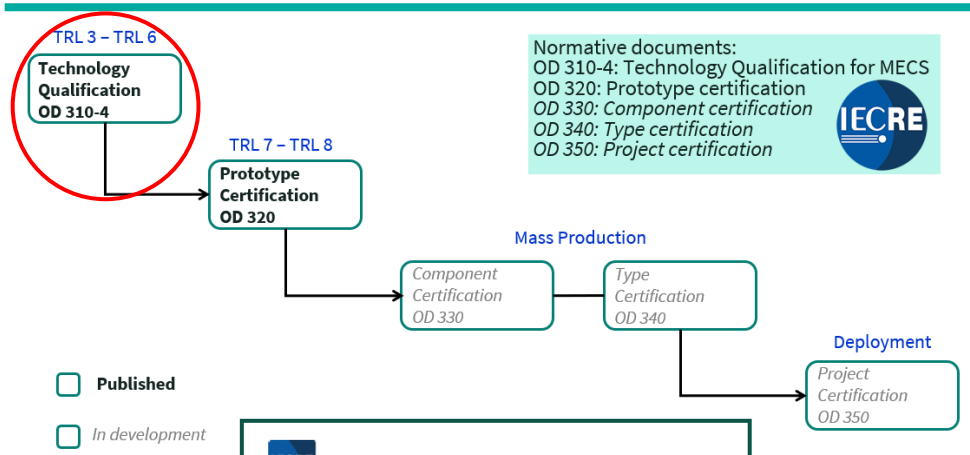
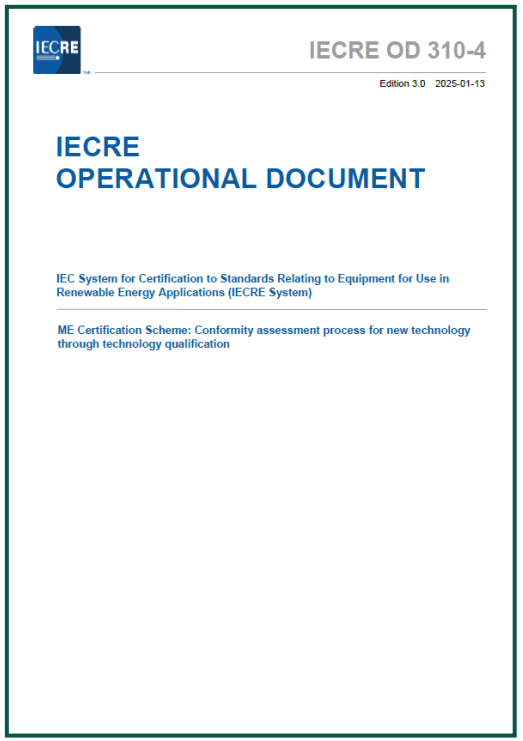
IECRE OD 310-4 (till from Feasibility to Conformity Statement)




IECRE OD 310-4

Edition 3.0 2025-01-13

IECRE
OPERATIONAL DOCUMENT

IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications (IECRE System)

ME Certification Scheme: Conformity assessment process for new technology through technology qualification

OD 310-4: Technology Qualification for Marine Energy Conversion Systems

- Review of Test procedures
- Review of test results
- Evaluation report for technology qualification (ER)

Deliverable: IECRE Conformity Statement for TQ

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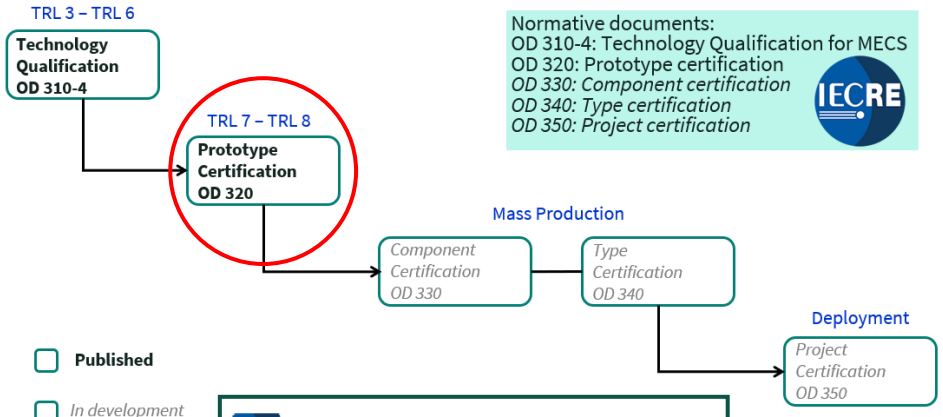
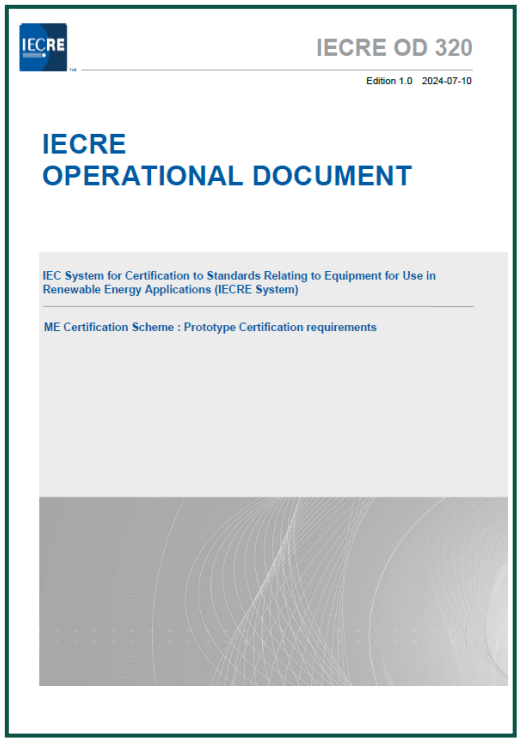
IECRE OD 320





OD 320: Prototype certification

- Development of prototype certification plan (PCP)
- RECB review of PCP and approval

Deliverable: IECRE Feasibility Statement for PCP

- Detailed design review
- Evaluation report for design (ER)

Deliverable: IECRE Conformity Statement for Design

- Review of test results
- Evaluation report for prototype certification (ER)

Deliverable: IECRE Prototype Certificate

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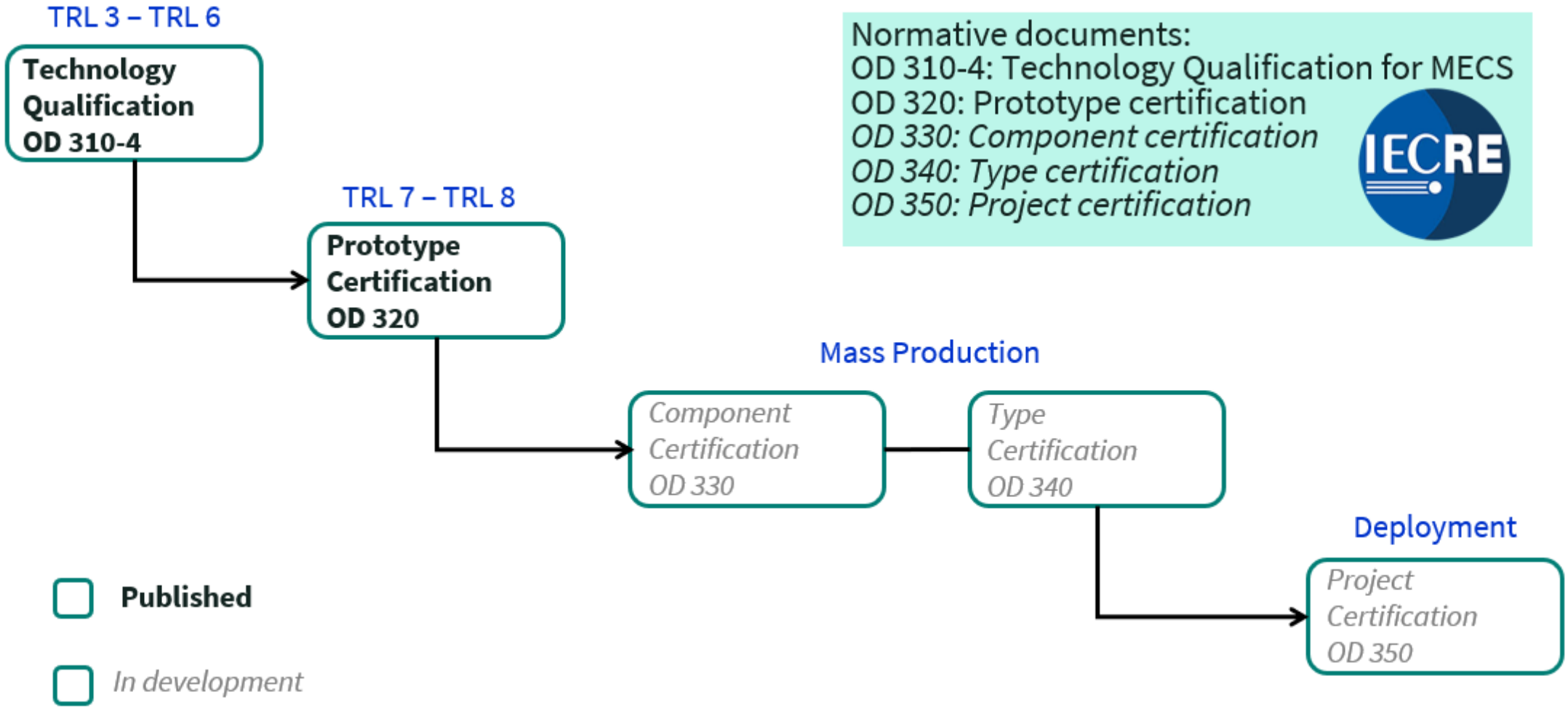
Recap



Normative documents:
OD 310-4: Technology Qualification for MECS
OD 320: Prototype certification
OD 330: Component certification
OD 340: Type certification
OD 350: Project certification

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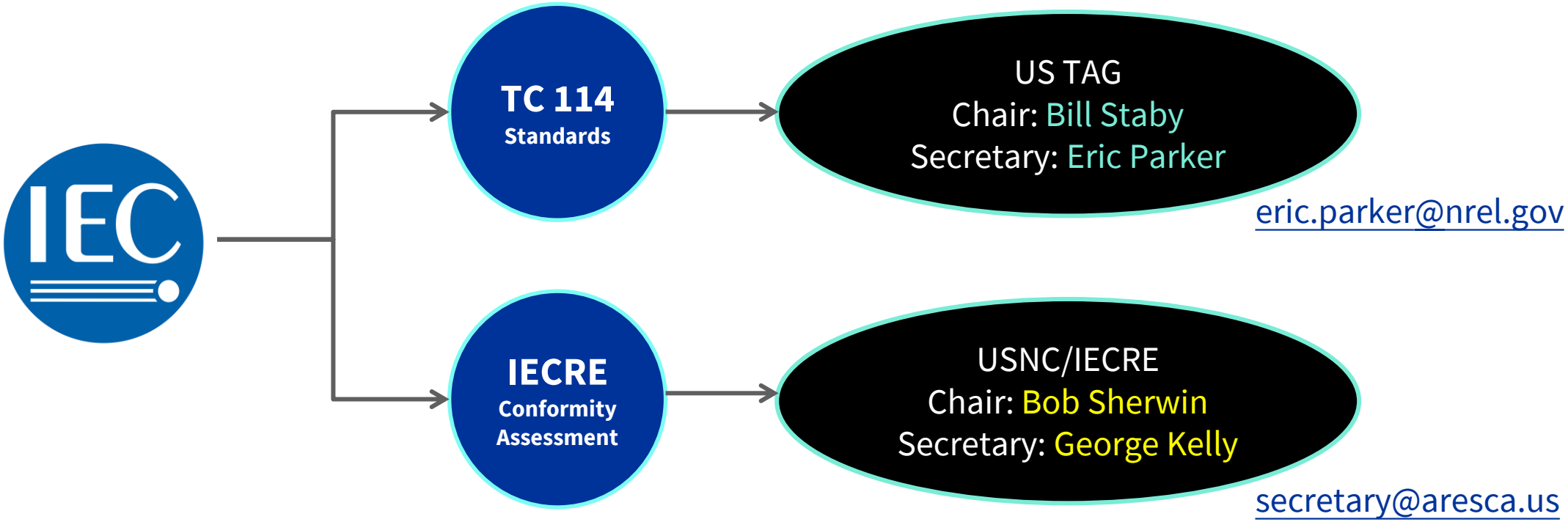
US IEC and IECRE management framework

TAG: Technical Advisory Group
TC: Technical Committee
USNC: US National Committee



Winston D’Souza PhD, CEng, MIET

Global Technical Authority for Offshore Renewables, Lloyd’s Register

Technical Manager, Lloyd’s Register Marine Ltd

Convenor: IEC TS 62600-4 (Technology Qualification)

Convenor: IECRE Marine Energy WG 360 and WG 361

Email : **winston.dsouza@lr.org**