The Current State of International Standards and Conformity Assessment for Marine Energy

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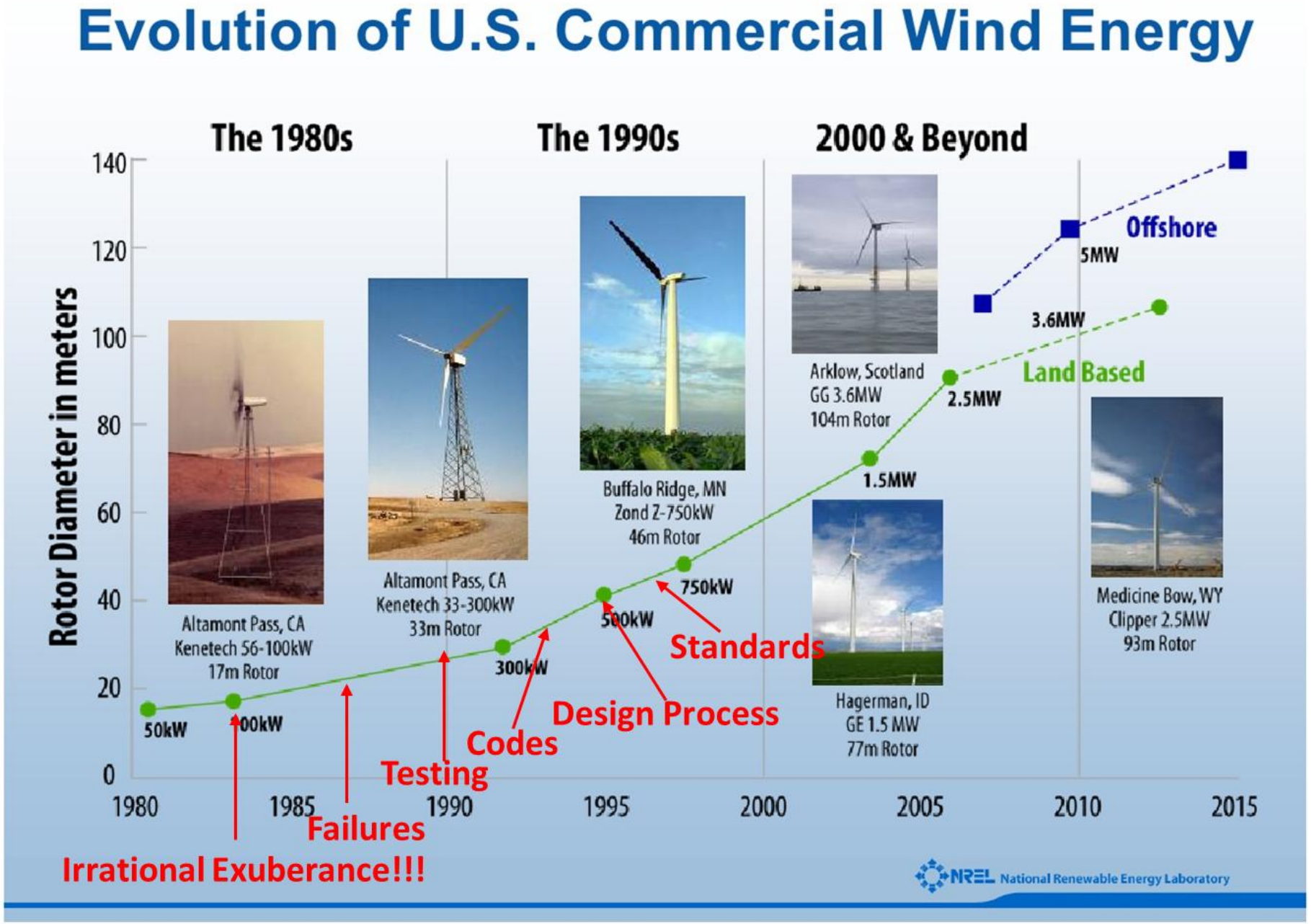
Why Standards – The Wind Industry Case



Why Standards? The Benefits of Standardization

- Reduces risk
- Increases confidence
- Improves market access
- Improves financing availability and terms
- Enhances insurability
- Supports the commercialization of the Marine Energy industry

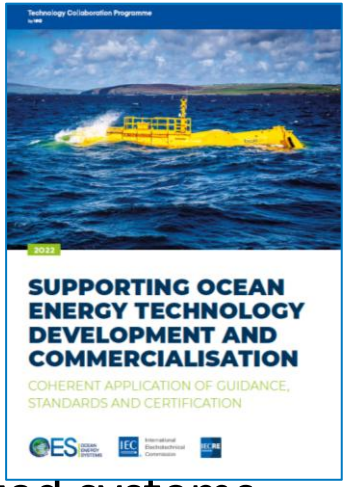
Why the IEC?

- Global recognition and acceptance of the IEC
- Well established international consensus-based process
- Consistent with global IECRE Conformity Assessment Systems
- Offices in 5 countries

IEC TC 114 Overview

International Electrotechnical Commission (IEC) Technical Committee (TC) 114 – Marine Energy **Dashboard: www.iec.ch/tc114/**

- Formed in 2007
- Chair: Jonathan Colby (United States), Secretary: Danny Peacock (United Kingdom)
- **17 published Technical Specifications (TSs)**
- 18 P-Member National Committees (Participating Countries)
- 12 O-Member National Committees (Observing Countries)
- 205 Subject Matter Experts
- Liaisons with
  - IEA-OES
  - TC-56 – Dependability
  - TC 82 – Solar photovoltaic energy systems
  - TC 88 – Wind energy generation systems
  - IEC TC 8/SC 8A and 8B– Grid integration, renewable energy generation, decentralized systems
  - ISO/TC 43/SC 3 – Underwater acoustics
  - ISO/TC 108/SC 5 – Condition monitoring and diagnostics of machines
  - IECRE Conformity Assessment System and the Marine Energy Sector Working Group
  - University Marine Energy Research Community (UMERC) Board of Directors



TC 114 Participating Countries (18) and IEC Offices

TC 114 Observing Countries (12) and IEC Offices

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 WEC			
-30 Electrical Power Quality				
-40 Acoustic Measurement				
-41 Biofouling				
-50 Turbulence				

Published

Under Development

Proposed

Active Project & Maintenance Teams (PTs & MTs)

Working Group	Abbreviated Title	Convenor National Committee
PT 62600-21	OTEC Electrical- Power Performance	Republic of South Korea
Proposed PT 62600-22	OTEC Resource Assessment	United States
PT 62600-41	Biofouling	United States
PT 62600-50	Turbulence	United Kingdom
PT 62600-104	Small/Tiny WECs	China
MT 62600-2	Design Requirements (3rd Edition)	United States & China
MT 62600-4	Technology Qualification	United Kingdom
MT 62600-10	Moorings	United States
MT 62600-40	Acoustic Characterization	United States
MT 62600-50	Turbulence Characterization	United States
MT 62600-100	Wave Power Performance	Canada
MT 62600-101	Wave Resource Assessment	United States
MT 62600-103	Wave Scale Testing	United States & Ireland
MT 62600-200	Tidal Power Performance	United States
MT 62600-201	Tidal Resource Assessment	United Kingdom & United States

Advisory Groups (AGs) & Ad-hoc Groups (AHGs)

Working Group	Abbreviated Title	Convenor National Committee
AG 1	Chair's Advisory Group	TC 114 Chair (United States)
AG 2	Publication Alignment Support	United States and China
AHG 10	Power Quality	Ireland
AHG 12	River Power Performance	Canada (China)
AHG 13	River Resource Assessment	United States
AHG 14	OTEC	United Kingdom
AHG 15	Loads Measurements	Netherlands & United Kingdom
AHG 18	Early-Stage Development - Tidal	United Kingdom
AHG 19	Strategic Business Plan (SBP) 2024-25	United States & China

Annual Plenary Meetings

2008	Ottawa, Canada (1st)
2009	Seoul, Republic of Korea
2010	Edinburgh, Scotland
2011	Boston, USA
2012	Oslo, Norway
2013	Tokyo, Japan
2014	Vancouver, Canada
2015	Dublin, Ireland
2016	Guangzhou, China
2017	Madrid, Spain (10th)
2018	Seattle, USA
2019	Delft, Netherlands
2020	Cancelled (Pandemic)
2021	Virtual
2022	Virtual
2023	Edinburgh, Scotland
2024	Jeju, Republic of Korea
2025	Dublin, Ireland
2026	TBD

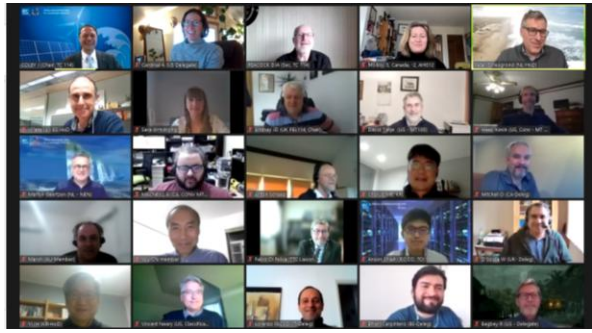
2009

2011

2015

2016

2017



2021 & 2022

2023

2024

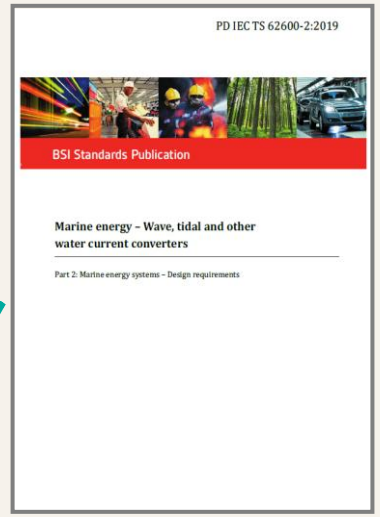
Why IECRE certification?

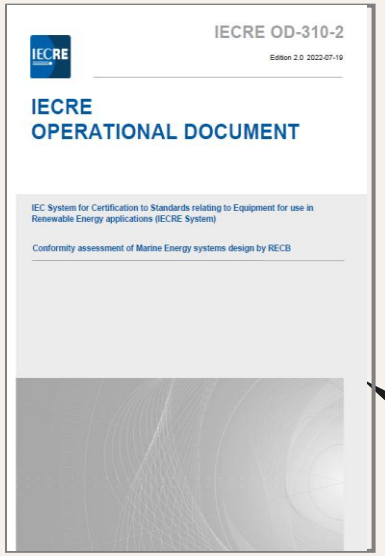
1. It is a single, global certification system
2. Consists of structured modular assessments based on consensus-based scope of work
3. Accepted by most national/local authorities or other bodies
4. Adopts globally accepted international standards as the basis for assessments
5. Implements a mutual recognition of deliverables from certification bodies and test labs that are part of the IECRE system
6. Aims to provide a transparent understanding of reports, statements and certificates for suppliers, sub-suppliers, end users and other stakeholders seeking information on the assessed technology

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)

Assessment must be done by an IECRE RECB

Scope of IEC 62600-2 (Design requirements)

Scope of IECRE OD 310-2 (Design requirements)

IECRE Certification bodies and Test labs.

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 TS 62600 standard

RECB

Renewable Energy Certification Body

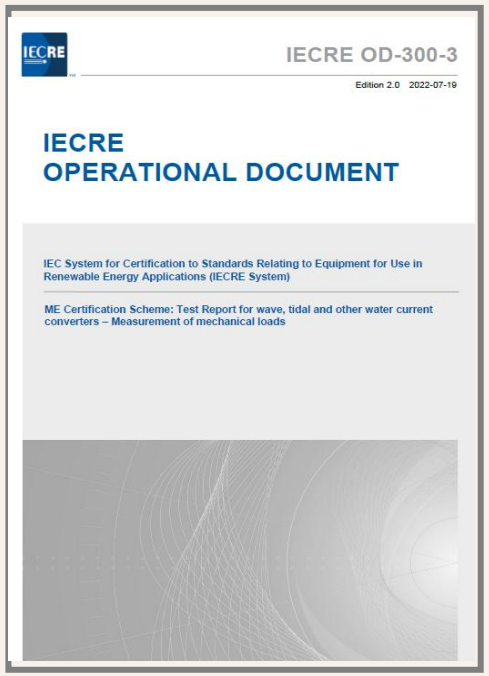
Lloyd's Register is the only IECRE RECB with a scope for Wind and Marine Energy technologies

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

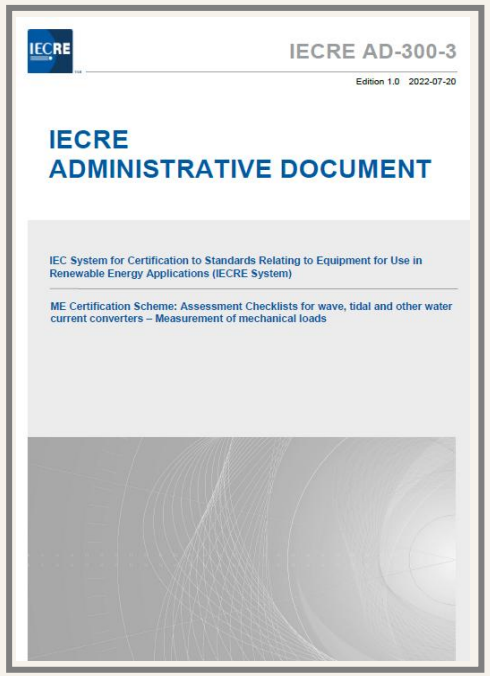
https://certificates.iecre.org/#/home

IECRE Certification system documents (inputs)

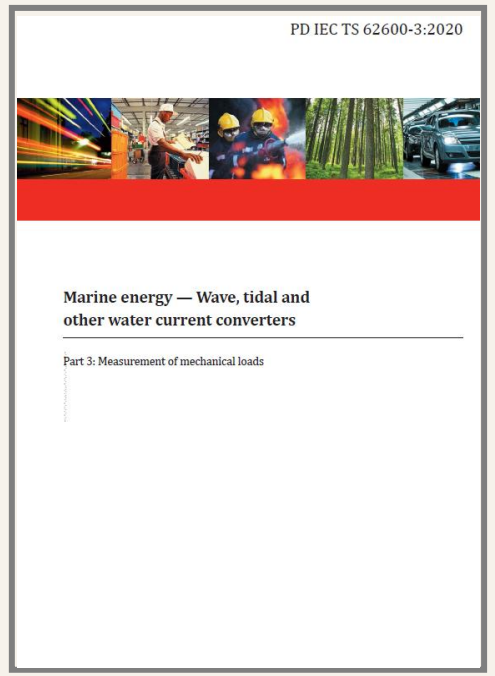
Operational documents



Administrative documents



IEC/ISO Standards



IECRE Certification deliverables (outputs)

Feasibility Statement: Based on IECRE OD 310-4 (and IEC 62600-4). Issued by a Marine energy RECB upon successful completion of a type of certification plan

Conformity Statement: Issued by a RECB based upon the successful completion of a specific scope of work against the requirements of IECRE operational documents within a certification process

Certificates: Issued by a RECB based upon the successful completion of an entire assessment against a set of IECRE operational documents and certification requirements

Test Reports: Issued by a RETL based upon the successful completion of a set of tests against the requirements of IECRE operational documents within a certification process

IECRE

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 — OMP-O-0-320, rev.2

Dated: 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.

Approved for issue on behalf of the IECRE Certification Body:

Issued on: 2025-03-20

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

In Summary: IEC and IECRE

- Significant progress has been made!
- Global participation is critical to the advancement of marine energy
- Need broader global participation in IEC Standards & IECRE Certification
  - Technology Developers
  - Project Developers
  - Test Centers
  - OEMs
  - Investors/Insurers/Regulators/Stakeholders

The US is able to participate in and support both IEC TC 114 and the IECRE ME thanks to US Department of Energy (US DOE) support.

The Way Forward: IEC and IECRE

The next steps for IEC TC 114, working with IECRE:

1) Advance existing Technical Specifications (TSs) *with feedback from industry and OEMs.*

2) Progress TSs to publication as International Standards

3) Begin writing the next essential Standards

4) Collaborate with IECRE to support operation of the Marine Energy Certification Scheme

- Test Reports
- Statements of Feasibility and Conformity
- Component, Prototype, Type, and Project Certificates