Wolfram Zeitz
Executive Secretary IECRE & IECEE
April 2022
Agenda

• IEC and IECRE in brief
• Renewable energy (RE) installations
• Reasons for the need of international standards and conformity assessment (CA)
• Definition of unique aspects of RE installations
• RE supply chain, where CA is used and why
• Why RE standards are needed at each level
• Why is RE certification unique
• IEC does NOT certify, what it DOES do
• Describe stakeholders & value proposition
IEC family

Global reach: 174 countries (88 members – 86 affiliates)
IEC

IEC is the abbreviation for International Electrotechnical Commission

- IEC is represented by 174 member countries representing
  - 99% of world population
  - 99% of electric power generation

- Scope
  - Standardization of devices and systems that produce electricity and contain electronics
  - Renewable energy
  - Interoperability
  - Safety
  - Performance
  - EMC (Electromagnetic Compatibility)
  - Environment

- Knowledge platform
  - 20,000 experts
  - >200 technical committees
  - >10,000 international standards
  - Testing and certification

- Many national standards originate from IEC standards
IEC management structure
IECRE

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

• IECRE operates a single, global certification system addressing 3 sectors
  – Solar photovoltaic (PV) power
  – Wind power
  – Marine energy

• Being part of IEC, IECRE benefits from global brand recognition
  – international organizations (e. g. WTO, UN)
  – local/national authorities
  – industry
  – banks and insurance companies
  – etc.

• Processes and rules are open, transparent, and clear
• All participants share a consistent approach and recognition (certification bodies, inspection bodies, test bodies)
• Uniform implementation, clear understanding, and delivery of information
• Uniform implementation and clear understanding of the certification processes (reports, statements, certificates)
IECRE structure

Conformity Assessment Board (CAB)
Management of conformity assessment policies, activities and systems (IECEE, IECEx, IECQ, IECRE)

IECRE management committee (REMC)
Management and overall operational responsibility of IECRE

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

IECRE Secretariat
Technical support
Administration

Marine energy sector working group (ME-SWG)

PV solar 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)
IECRE common elements

IECRE System

WE-SWG
Wind Energy Scheme

Type
- Turbine design
- Turbine testing
- Manufacturing quality

ME-SWG
Marine Energy Scheme

Type
- Turbine design
- Turbine testing
- Manufacturing quality

PV-SWG
PV Solar Energy Scheme

Type
- Component design
- Component testing
- Manufacturing quality

Factory

Project
- Installation
- Commissionning
- Operation

Field

Project
- Installation
- Commissionning
- Operation

Project
- Installation
- Commissionning
- Operation
### IECRE participation by country

As per IEC CA 01, Basic Rules, countries listed as **Voting Members** are identified with the "star" icon. Countries listed as **Non-voting Members** are identified with the "eye" icon.

<table>
<thead>
<tr>
<th>Country</th>
<th>Member Body Name</th>
<th>Voting Member</th>
<th>Marine Energy</th>
<th>Solar Energy</th>
<th>Wind Energy</th>
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<tbody>
<tr>
<td>Australia</td>
<td>Joint Accreditation System of Australia and New Zealand (JAS-ANZ)</td>
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<td>Belgium</td>
<td>CEB-BEC</td>
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<td>Certification and Accreditation Administration of the People’s Republic of China (CNCA)</td>
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<td>Denmark</td>
<td>IEC National Committee of Denmark</td>
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<td>France</td>
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<td>Germany</td>
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<td>Japan</td>
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<td>Korea, Republic of</td>
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<td>Saudi Arabia</td>
<td>SASO (Saudi Standards, Metrology and Quality Org.)</td>
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<td>United Arab Emirates</td>
<td>Ministry of Industry and Advanced Technology (MoIAT)</td>
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<td>United Kingdom</td>
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<td>United States of America</td>
<td>USNC/IECRE</td>
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Why IEC Standards and conformity assessment?

• ~200 bn US$ international renewable energy market just for new installations (wind and solar each ~100 bn US$, marine still nascent)
• Harmonized international consensus standards throughout RE industry
• Harmonized conformity assessment
• Harmonized interpretation
• Reduced risk
• Peer assessment
• Transparency
• Mutual acceptance
• Broad stakeholder engagement
• Unique RE international CA system
Importance of IECRE Conformity Assessment

IEC Standards ↔ Two sides of one coin ↔ IECRE conformity assessment

IECRE conformity assessment system replaces IEC 61400 – 22 standard
Reason: It’s not a standard but rather a conformity assessment system

A one-sided coin has no value!
A RE power plant is just like any power plant, a complex system...

• RE systems are assembled from many large and small components, which all have to work harmoniously to produce reliable energy
• Depending on technology: blades, gears, towers, panels, cables, controllers, etc.
• Components assessed by
  − design analysis assessment
  − model validation
• System assessed by
  − design analysis assessment
  − component validation
• Requires field assembly, commissioning and O&M
• Interconnection compliance
• Every turnkey system is a unique field installation
Components and systems cannot be tested to design specifications (specific to wind applications)

Power driving components are immediately exposed to the environment

The “energy sources” are not continuously available 24/7

The variables of the power sources vary constantly, and with this, loads and degradation:
- Wind turbine: Wind loads (incl. gusts), icing, wildlife etc.
- PV power plant: Wind loads, snow loads, hail, temperature, sand abrasion, irradiation, wildlife etc.
- Marine power plants: Water current, wildlife etc.

Min. 20 years design life may result in challenges given the direct environmental exposure to power generation devices

Each installation is unique as it must fit the particular geology and geography of its location, and in addition, the design criteria need to meet demand (one size does not fit all!)

Assessment must depend on design analysis and model validation through testing

Turn key system reliability and performance depend on upstream component certifications AND installation / maintenance quality

...however, unlike conventional power plants, RE power plants face unique exposures
RE supply chain, where CA is used and why

**Wind:**
- Blades
- Bearings
- Gearboxes
- Towers
- Panels
- Actuators
- Controllers
- Converters
- Foundations
- Cables
- Grid connection
- Etc.

**Photovoltaic:**
- Panels
- Inverters
- Connecting cables
- Trackers (optional)
- Cables
- Cable conduits
- Controllers
- Inverters
- Foundations
- Grid connection
- Cleaning machines
- Etc.

**Marine:**
- Blades
- Bearings
- Gearboxes
- Towers
- Panels
- Actuators
- Controllers
- Converters
- Foundations
- Cables
- Grid connection
- Etc.
Why are RE standards and conformity assessments needed at each level?

• Reliability depends on integrated system design of many components

• Each individual component contributes to the successful interaction of the system:
  - Wind: blades, bearings, gearboxes, generators, towers, foundations, controllers, etc.)
  - PV: panels, actuators, support structures, inverters, cables
  - Marine: wave/current/tidal energy converters
How does the IECRE system work?

- IECRE itself does NOT certify, however, IECRE assures through a systematic approach that system participants who issue certificates are qualified.
- Qualified registered participants are competent to assess RE equipment and projects:
  - RECBs (RE Certification Bodies)
  - REIBs (RE Inspection Bodies)
  - RETLs (RE Test Laboratories)
- Competence validation through regular, revolving peer assessment.
- Proper IEC and other international standards are referenced insuring appropriate interpretation of standards.
- Transparency.
- Influence for all stakeholders:
  - All stakeholders have a voice (RECBs, REIBs, RETLs, OEMs, End Users).
  - All national member bodies have a vote.
  - All participating member bodies recognize & accept IECRE certificates.
Peer assessment is crucial for the IECRE system

Onsite assessment
Acc. To ISO/IEC 17025

Operational documents (ODs)

Peer assessment committee

Assessment report

* Peer assessment committee
Who are the IECRE stakeholders?

- OEMs, EPCs
- RECBs, RETLs, REIBs
- Independent Engineers (IEs)
- End Users
  - Developers
  - Operators
  - Owners
  - Banks
  - Insurers
  - Grid operators
  - Regulators
- Etc.
What is the motivation for different stakeholders to make use of the IECRE system?

- OEMs, EPCs: Level playing field, mutual acceptance
- RECBs, REIBs, RETLs: Expanded market, increased value, proven proficiency
- Independent Engineers: Market, value, proficiency
- End Users
  - Developers: Consistency, quality, resale value
  - Operators: Quality, reliability
  - Owners: Risk management, performance, resale value
  - Banks: Risk management, performance, resale value
  - Insurers: Grid compliance, reliability
  - Grid operators: Grid compliance, reliability
  - Regulators: Safety, code compliance
Imprint

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