SMB/6616/SBP

STRATEGIC BUSINESS PLAN (SBP)

IEC/TC OR SC:	SECRETARIAT:	DATE:
114	**UK**	**2018-11**

Please ensure this form is annexed to the Report to the Standardization Management Board if it has been prepared during a meeting or sent to the Central Office promptly after its contents have been agreed by the committee.

A. STATE TITLE AND SCOPE OF TC

TC114: Marine Energy – Wave, tidal and other water current converters,

TC114 was established by the IEC in 2007 and the inaugural plenary was held in Ottawa, Canada in May 2008. Since then, TC114 annual plenaries have been held in Seoul, Republic of Korea (2009), Edinburgh, Scotland (2010), Boston, USA (2011), Oslo, Norway (2012), Tokyo, Japan (2013), Vancouver, Canada (2014), Dublin, Ireland (2015),Guangzhou, China (2016) and Madrid, Spain (2017)

The scope of TC114 was established at the first plenary in 2008 and modified in 2015. An updated scope is provided here:

"To prepare international standards for marine energy conversion systems. The primary focus will be on conversion of wave, tidal and other water current energy into electrical energy, although other conversion methods, systems and products are included. Tidal barrage and dam installations, as covered by TC 4, are excluded. The standards produced by TC 114 will address:

- terminology
- management plans for technology and project development
- performance measurements of marine energy converters
- resource assessments
- design and safety including reliability and survivability
- deployment, commissioning, operation, maintenance, retrieval and decommissioning
- electrical interface, including array integration and / or grid integration
- testing laboratory, manufacturing and factory acceptance
- additional measurement methodologies and processes"

B. MANAGEMENT STRUCTURE OF THE TC

TC114 is comprised of Project Teams, Maintenance Teams and ad-Hoc Groups.

As of January 1, 2018, the following countries were either participating (P) countries or observing (O) countries:

Participating (P) Countries: Canada, China, Denmark, France, Germany, Iran, Ireland, Israel, Japan, Republic of Korea, Netherlands, Spain, Sweden, United Kingdom, United States

Observing (O) Countries: Brazil, Czech Republic, Italy, Norway, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Singapore, Ukraine

Publications:

As of January 1, 2018, the following TC114 publications have been issued:

IEC/TS 62600-1:2011 Edition 1.0 (2011-12-07)

Marine energy - Wave, tidal and other water current converters - Part 1: Terminology

IEC/TS 62600-2:2016 Edition 1.0 (2016-08-10)

Marine energy – Wave, tidal and other water current converters – Part 2: Design requirements for marine

energy converters

IEC/TS 62600-10:2015 Edition 1.0 (2015-03-27)

Marine energy – Wave, tidal and other water current converters – Part 10: Assessment of mooring system for marine energy converters (MECs)

IEC/TS 62600-100:2012 Edition 1.0 (2012-08-30)

Marine energy - Wave, tidal and other water current converters - Part 100: Electricity producing wave energy converters - Power performance assessment

IEC/TS 62600-101:2015 Edition 1.0 (2015-06-05)

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

IEC/TS 62600-102:2016 Edition 1.0 (2016-08-09)

Marine energy - Wave, tidal and other water current converters – Part 102: Wave energy converter power performance assessment at a second location using measured assessment data

IEC/TS 62600-200:2013 Edition 1.0 (2013-05-07)

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

IEC/TS 62600-201:2015 Edition 1.0 (2015-04-09)

Marine energy - Wave, tidal and other water current converters - Part 201: Tidal energy resource assessment and characterization

Liaisons:

As of January 1, 2018, TC114 has established official liaisons with the following organizations:

IEC: TC 4 (Hydraulic Turbines); TC 8 (Systems aspects of electrical energy supply); TC 8/SC 8A (Grid Integration of Renewable Energy Generation); TC 8/SC 8B (Decentralized Electrical Energy Systems); TC 88 (Wind Turbines);

ISO: TC 43/SC 3 (Underwater Acoustics); TC 108/SC 5 (Condition monitoring and diagnostics of machines)

International Energy Agency – Ocean Energy Systems: Annex 1-5

C. BUSINESS ENVIRONMENT

For countries involved in the marine renewable energy sector, investments have continued over the past several years but at varying rates according to changes in economic conditions, environmental regulations and government policies. While some countries have imposed government funding cuts because of reductions or eliminations of subsidies and tax credits, others have implemented consistent budget increases and policy changes aimed at reducing costs associated with prototype testing and regulatory compliance. As a result, marine energy convertor technologies have continued to progress towards commercialization however they face competition from continuing reductions in costs and growing acceptance of wind and solar technologies.

For example, tidal current devices have begun to mature and converge towards a smaller set of technological configurations and pre-commercial deployments of small arrays are now taking place. Wave energy research and development is tackling a range of engineering and technology challenges, with systematic efforts focused on refining component designs and testing initiatives that yield cost reductions and increased operational reliability.

World marine renewable energy resource estimates continue to represent a huge opportunity. Many nations are seeking alternatives to fossil fuel and nuclear power, and those with significant hydropower resources are motivated to investigate marine renewable energy. With the overall cost of energy being the key driver, reductions in capital costs and life-cycle operational costs will continue to be the primary focus of research and development efforts. There are a small number of pre-commercial arrays operating in some locations which will help to build operational experience and further inform design requirements. The industry continues to carry out testing of reduced scale prototypes in tanks and sheltered sea areas as well as in open sea and in-stream river sites. With such additional experience and sharing of lessons learned, marine renewable energy is steadily evolving and is approaching cost competitiveness in several commercial applications.

D. MARKET DEMAND

The customer base for published and future TC 114 standards is as follows: industry (device and project developers and manufacturers), utility companies, investors, insurers, national and local government bodies, test centres, certification bodies and regulators. The development of the IECRE Conformity Assessment System for renewable energies (wind, solar PV and marine) entitled “IEC System for Certification to Standards Relating to Equipment for use in Renewable Energy Applications” is proceeding and giving rise to growing demand for published Standards and Technical Specifications. Feedback from standards users, TC 114 National Committees and the IECRE Marine Energy Operational Management Committee (ME-OMC) will generate on-going demand for new Standards and Interpretation Sheets.

It should be noted that market demand is limited at present as there is no solid industry bias. IEC should be publicising and encouraging the development of the industry thereby providing impetus to industry growth.

E. TRENDS IN TECHNOLOGY AND IN THE MARKET

Testing of individual devices at both full and reduced scales remains the primary focus of industry activity. There is also a trend to continue the operation of test devices often with instrumentation enhancements to facilitate research programmes. The focus of these includes design or power capture verification, performance enhancements, acoustic characterization and visualisation of wildlife close to devices and modelling/measuring of turbulence, among other topics.

A significant number of demonstration projects of single devices have been progressed and some small arrays of multiple devices are emerging to improve technology acceptance and prepare for commercialization. Testing of arrays and examination of the resource reduction caused by small clusters of devices will give rise to requirement for new standards.

Test facilities are emerging in many more locations around the world and efforts will be made to harmonise and coordinate ways in which testing is conducted to assist in the opening up of international markets. Several nations are seeking to establish “centres of excellence” based on test facilities.

Market opportunities are arising for marine energy from supplying dedicated customers and isolated communities. In a number of cases, islands and other remote communities represent niche opportunities for the deployment of marine renewable energy devices. Other opportunities exist where a dedicated customer may exist for the purchase of renewable marine-generated power. In some locations, combining marine energy with batteries, hydrogen manufacturing systems, or other developing storage technologies to “smooth out” the production profiles is under consideration. Various initiatives and new standards are being considered to meet the challenges of “Smart Grids” and particularly the impact of these on niche ocean energy projects.

Lack of grid infrastructure remains a challenge and in some jurisdictions physically prevents growth of marine

energy. Very often the sources of demand on a larger scale are remote from the marine energy resources. For some regions this is a serious problem to continuing development of marine energy.

Research continues on a range of environmental sensitivities in several countries. In addition, skills and techniques in environmental monitoring are being built up. The evidence to date is that there is negligible impact on the environment indicated due to single devices or a number of separate single devices in a given area. Similar studies will need to be carried out in the early or initial array locations to further verify this or otherwise. The committee will work to standardize measurement methodologies of physical parameters of the devices (e.g. vibration, noise, electromagnetic fields) to support these studies.

Sustainability has to remain at the heart of all marine energy developments; some standardisation of approach to environmental monitoring is frequently called for to ensure consistency on an international basis. It is accepted that any detailed guide to environmental impact assessment is problematic due to the varying legislative regimes that different countries may have. Significant international dialogue continues to try and harmonise approaches to sustainable development as far as practicable.

F. SYSTEMS APPROACH ASPECTS (REFERENCE - AC/33/2013)

The Technical Specifications which are under development and those which are being maintained may found on the home webpage for TC 114: www.iec.ch/tc114/. The table below provides the TC 114 activities in the context of Technical Areas and includes additional international activities that are, or may be, relevant

Technical Area	Foreground TC114 Activity	Background Knowledge & External Liaison Opportunities
Terminology	-MT 62600-1: Terminology [IEC/TS 62600-1]	-IEC/TC 1: Terminology [IEC 60050 (all parts)]
Electrical Interface	-PT 62600-30: Power quality	-IEC/TC 8/SC 8A: Grid integration of renewable energy generation -IEC/TC 8/SC 8B: Decentralized electrical energy systems -IEC/TC 18: Electrical installations of ships and of mobile and fixed offshore units -IEC/TC 18/SC 18A: Electric cables for ships and mobile and fixed offshore units -IEC/TC 20: Electric cables [IEC 63026] -IEC/TC 22: Power electronic systems and equipment -IEC/TC 82: Solar photovoltaic energy systems [IEC 61727] -IEC/TC 88: Wind energy generation systems [IEC 61400-21, IEC 61400-27-1]
Marine Structures, Moorings and Foundations	-MT 62600-2: Design [IEC/TS 62600-2] -AHG 6: Moorings [IEC/TS 62600-10] -PT 62600-3: Measurement of mechanical loads -PT 62600-20: OTEC -ISO 13628-2 Flexible pipe systems -ISO 13628 -5 Control Umbilicals	-IEC/TC 37/SC 37A: Low-voltage surge protection [IEC 61643-11] -IEC/TC 56: Dependability [IEC 60812] -IEC/TC 81: Lightning protection [IEC 62305-3] -IEC/TC 88: Wind energy generation systems [IEC 61400-1,IEC61400-3] -ISO/TC 8:Ships and marine technology [ISO 29400] -ISO/TC 61/SC 2: Mechanical behavior [ISO 527-1] -ISO/TC 61/SC 13: Composites and reinforcement fibres [ISO 13003, ISO 14125, ISO 14126, ISO 14129, ISO 14130, ISO 15024] -ISO/TC 67/SC 6: Processing equipment and systems [ISO 17776] -ISO/TC 67/SC 7:Offshore structures [ISO19900, ISO 19901 (all parts), ISO 19902, ISO 19903, ISO19904] -ISO/TC 98/SC 2: Reliability of structures [ISO 2394] -ISO/TC 156: Corrosion of metals and alloys [ISO 12473]
Renewable Energy Production	-AHG 3: Wave power performance [IEC/TS 62600-100] -AHG 3: Wave power performance at a 2nd location [IEC/TS 62600-102] -AHG 4: Tidal power performance [IEC/TS 62600-200] -PT 62600-300: River power performance	-IEC/TC 8/SC 8A:Grid integration of renewable energy generation -IEC/TC 8/SC 8B: Decentralized electrical energy systems -IEC/TC 38: Instrument transformers [IEC 61869-2, 61869-3] -IEC/TC 77/SC 77A: EMC - Low frequency phenomena

		[IEC 61000-3 (all parts) -IEC/TC 82: Solar photovoltaic energy systems [IEC 61724-1, IEC 61724-2, IEC 61724-3, IEC 61853-1, IEC 62253, IEC 62670-1, IEC 62670-2, IEC 62670-3] -IEC/TC 85: Measuring equipment for electrical and electromagnetic quantities [IEC 60688] -IEC TC 88: Wind energy generation systems [IEC 61400-12- 1, IEC 61400-12-2] -IHO
Environmental	AHG 5: Wave resource assessment [IEC/TS 62600-101] -AHG 7 : Tidal resource assessment [IEC/TS 62600-201] -PT 62600 -40 : River resource assessment -PT 62600-3 : Acoustic characterisation of marine energy converters	-IEC/TC 4: Hydraulic turbines - IEC/TC 88: Wind energy generation systems [IEC 61400-11, IEC 61400-12-1] -ISO/TC 8: Ships and marine technology -ISO/TC 43/SC 3: Underwater acoustics -ISO/TC 67: Materials, equipment and offshore structure for petroleum, petrochemical and natural gas industries - ICES -IHO
Marine Testing	-PT 62600-3: Measurement of mechanical loads - PT 62600-103 : Scale testing of wave wave energy converters -PT 62600-202: Scale testing of tidal energy converters	-IEC/TC 88: Wind energy generation systems [IEC 61400-13, IEC 61400-23] -ISO/TC 8: Ships and marine technology -ISO/TC 67:Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries - ITTC
Electro-Mechanical Power Conversion Systems	-MT 62600-2: Design [IEC/TS 62600-2] -PT 62600-3: Measurement of mechanical loads	-IEC/TC 4: Hydraulic turbines -IEC/TC 18: Electrical installations of ships and of mobile and fixed offshore units -IEC/TC 18/SC 18A: Electric cables for ships and mobile and fixed offshore units -IEC/TC 88: Wind energy generation systems [IEC 61400-4] -ISO/TC 60: Gears -ISO/TC 131: Fluid power systems

G. CONFORMITY ASSESSMENT

TC114 documents will be used to support the Marine Energy Sector (ME-OMC) of the IECRE System.

Firstly, priority will be given to standards or Technical Specifications that are most urgently needed for certification purposes. These will be identified by IECRE ME-OMC and submitted to TC114 for consideration and implementation. For example, a requirement for a standard approach to the measurement of loads in MEC systems was identified by the ME-OMC and was subsequently implemented by TC114.

Secondly, conformity aspects will be considered at the appropriate stage in the development process in a relevant manner. Therefore, for example, conformity will not be applied significantly at the R&D stage and would be applied as an option at the demonstration stage. In the later stages of industrialisation of MEC systems, conformity will take on far greater importance from design through construction to deployment and operations.

Thirdly, TC 114 will actively seek to follow approaches by related sectors such as the wind industry, modifying them for application to the marine energy sector. As far as possible TC114 will establish formal Liaisons to facilitate this.

H. 3-5 YEAR PROJECTED STRATEGIC OBJECTIVES, ACTIONS, TARGET DATES

The over-arching objective of TC 114 is to support the development and implementation of marine energy converter technologies and facilitate progress towards the realization of commercial-scale projects and applications. During the next 3 to 5 years, TC114 will: (1) complete a number of TSs currently under development, (2) initiate Project Teams to begin drafting a limited number of new TSs, and (3) support Maintenance Teams and ad-Hoc Groups for several recently developed Technical Specifications (TSs), all geared toward the ultimate completion of first edition International Standards.

The engagement of user groups in standards-making activity, particularly Technology Developers, is encouraged. Possible approaches could include assigning formal liaisons with funded projects that provide feedback and inform present and future TSs and stimulates their transition to International Standard.

The Technical Specifications which are under development and those which are being maintained may be found on the home webpage for TC114 as identified in Section F above. These specifications have been highlighted as being fundamental to the early stage development of marine energy converters. Future specifications will be undertaken as the needs of the marine energy sector dictate. To facilitate this strategy, TC114 has established a priority list of specifications to be developed. This list may be rearranged and expanded as new information and understanding of the sector becomes available; however, it currently provides a baseline for the committee to use when deciding upon convening new Project Teams.

In establishing the priority of standards, both those underway and those being planned, TC114 has considered both the stage of development of marine energy converters and the impact that particular standards will have on the progress of the sector. The IECRE will provide input to TC114 regarding Technical Specifications necessary to support certification of marine energy converters.

Regarding standards supporting the progress of devices along their design path, standards which are under development address the full range of engineering stages, including:

- Modelling and analysis
- Full- or Sub-scale testing
- Prototype deployment and testing
- Operational devices and arrays

In terms of the critical nature of the standards, consideration is given in the following priority (while not inflexible, the listing below represents an overall priority at this stage of the industry development):

1. Technology Qualification Plan*
2. Cable lay guidelines and procedures
3. Design guidelines for subsea cables / cable networks and performance / reliability of connectors
4. Design guidelines for marine energy system connection to distribution level grid including small scale/ community projects
5. Installation (deployment) and retrieval procedure guides

6. Performance of arrays
7. Operation and maintenance principles
8. Commissioning and decommissioning procedures
9. Data acquisition and communications
10. Measurement methodologies including physical parameters of devices

There may be circumstances wherein specialized components or assemblies of marine energy converters (e.g. power take off systems) would require the development of specific standards

When considering new specifications, the committee seeks to avoid creating new work item proposals which do not address the most urgently needed specifications. Members may propose new specifications to be added to the list above, and the committee will decide on the prioritization of the proposed new specification based on a consensus as to the urgency of need. Of particular importance is to time the establishment of new Project Teams so as not to over-extend the availability of members to support new work.

**Ongoing efforts under the IECRE Marine Energy Operational Management Committee (ME-OMC) have identified the need for a Technical Specification on a Technology Qualification Plan (TQP) for use in the certification process. Work is currently underway to develop a rough draft of this Technology Qualification Plan, a refinement of the previously referenced Process Management Plan, for TC 114 consideration. TQP is a methodology for risk-based assessment of any device that contains new or unproven technology for which there are no existing standards against which to assess conformance*

STRATEGIC OBJECTIVES 3-5 YEARS	ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES	TARGET DATE(S) TO COMPLETE THE ACTIONS
TS Ed 1 transition to TS Ed 2and IS Ed 1	The committee intends to transition existing 1st Ed. Technical Specifications into 2nd Ed. Technical Specifications and 1st Ed. International Standards (3-5 years). The manning of these tasks is considerable due to the immaturity of the industry so there may be a need to sequence work in a prioritized manner.	3 – 5 years
Publish PT documents	TC114 will make a concerted effort to publish all existing (in process) Project Team documents (1-3 years). During this time there will be a need to balance the original needs of the industry and the emerging need to support developing certification requirements.	1 – 3 years
ME-OMC input	Those members of TC114 coordinating with the certification effort will request input from the IECRE Marine Energy Operational Management Committee (ME-OMC) on additional missing standards to be compared to listing in Section H (1 – 3 years). This input combined with original needs of the industry will create the future work lists.	1 – 3 years
Review NWIP recommendations	The committee will carefully review recommendations for new work items in the next 12 months in order to assess priorities of Section H and input from the IECRE ME-OMC and industry. a. It would be appropriate to establish an integrated priority work list (12-18 months) b. Assess how many new work items can be supported as the existing work is completed and support to the certification scheme is emerging.	12 – 18 months
Receive information on TSs	Establish ad-Hoc Groups to receive information from published Technical Specifications in order to more quickly turn around next editions or move to standards.	0 – 5 years
Note: The progress on the actions should be reported in the RSMB.		