Title of TC
Marine energy - Wave, tidal and other water current converters

A Background
TC 114 was created by IEC in 2007; the inaugural meeting was held in May 2008.

The existing scope of the Technical Committee is:

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:
- system definition
- performance measurement of wave, tidal and water current energy converters
- resource assessment requirements, design and survivability
- safety requirements
- power quality
- manufacturing and factory testing
- evaluation and mitigation of environmental impacts

B Business Environment
B.1 General
In comparison to other more established renewable energies, there has been modest investment in marine energy. Although there has been on-going research in this field for the last 30 years, the technologies developed to harness the energy from waves, tidal and water currents are at early stages of development. In the last few years, more focused attention has been given to this technology as countries are looking for alternative options to increase the amount of renewable energy production in their power production mix.

It is recognized the ocean presents a vast amount of power that could theoretically be extracted. Current ocean energy resource theoretical estimates range between 8 000 - 80 000 TWh/y for ocean wave energy and greater than 800 TWh/year for marine currents.

Lowering the costs of these technologies through more efficient designs while using low-cost materials and components, along with economies of scale, aim to improve the overall economic viability and acceptability of wave, tidal and water current energy converters.

The establishment of international standards will assist in mitigating the technical and financial risks associated with the diverse range of technologies that currently exist enabling a quicker uptake of commercial marine energy production.

B.2 Market demand
Customers for the issued and future standards will be industry (device and project developers and manufacturers), national and local government bodies, test centres, certifying bodies and regulators. As this is a developing standardization area, it is
expected that there may be additional interested parties who will be determined and solicited to participate.

**B.3 Trends in technology**

In the near term, these technologies will likely continue to focus on executing prototype deployments and on investigating multi-device, large-scale deployments. In the medium term, these technologies may become significant contributors to those markets adjacent to the resource. In the longer term, when hydrocarbon scarcity becomes a more serious constraint and new forms of energy transmission are required, ocean energy will become a more important part of the world's energy portfolio.

In 2008, there was the commissioning of the first commercial-scale deployment of three wave energy devices in an array configuration. Furthermore, the first commercial scale tidal turbine was installed and commissioned in Northern Ireland. There remains a large spectrum of wave and marine current devices that are being tested at the 1/4, 1/2 and 3/4 scale with some approaching commercial size deployment in the near future.

**B.4 Market trends**

This technology is now experiencing deployments that are grid connected. In order for there to be significant market entry of offshore renewable energy, suitable grid infrastructure is required. Given the variable nature of wave power, it is unlikely that it will be suitable for base load power but will be valuable in reducing consumption of traditional energy resources. Tidal power is more predictable and could also contribute to base load power supply. Marine energy also has the potential to power remote communities that are otherwise reliant on diesel or similar generating systems. It can also be combined with other sources of renewable energy given a suitable energy storage system is in place and supporting integration systems are developed.

**B.5 Ecological environment**

The interaction of wave, tidal and water current technologies within the marine environment must result in a low environmental impact in order to be fully sustainable. These technologies are being deployed in highly sensitive marine environments. The development of sound environmental practice will be necessitated to minimize any potential harmful effects that installation and operation of these devices may have.

**C System approach aspects**

A system approach table will be developed as and when more experience is available from interactions with these and possibly other TCs and organizations.

The project teams for Design, Device Performance, and Resources Assessment are well under way. New work items are being considered as the present PT work progresses and subject matter is identified as required to round out the industry and its technical progress moves forward. The addition of Electrical Power Quality Requirement will address grid connection and integration which will then bring the TC to the point of full systems engineering. The TC has begun to move forward on OTEC and scale testing for traditional marine hydro-kinetic devices. As a result the TC is now dealing with the full spectrum of technical issues from scale testing to grid integration.

Due to the work programme for TC 114 increasing, which has resulted in the increase in the number of project teams, a Chairman's Advisory Group has been established. Each project team has been and will continue to organize their internal meetings and exchange information with their respective working groups. The role of the TC Secretary remains essential to the dissemination of essential information to the TC memberships and liaison with the Central Office.

The Chairman will continue to promote and monitor liaisons with related TC's such as TC-88 for floating wind moorings and off shore wind farm elements important to MHK arrays. In addition, liaisons are being considered and sought with other international technical groups that have an interest in the development of the industry or can contribute to the standards development.
D Objectives and strategies (3 to 5 years)
The TC has addressed priority specifications that were decided as being of primary importance for the early industry development. The emphasis is now shifting to ensuring those products progress to publication. Discussions pertaining to the conformity assessment are underway and the CAB has established a working group in cooperation with the TC to begin to address this aspect. The TC will continue to assess the need and response to environmental questions or implications as the technology matures and is deployed. Environmental elements are often driven by national or local regulations and are frequently difficult to address on the international level. While this is a concern the TC will maintain a monitoring role in this field.

Due to the demand for resources in ongoing work and limited experience in the field the Technical Committee has established and agreed upon several protocols in submitting new work.

A new work item must be discussed at the TC 114 Plenary Meeting prior to submission to allow national committee’s to assess the resources available to support planned new work items.

A new work item may reference existing documents but may not attach those documents to the NWIP to prevent creating an impression that the work is minor due to the existence of a supporting document. The NWIP must stand on its merit in view of the national committee’s. The reference documents may be presented to the Project Team after approval of the NWIP.

The next area of concern is the initiation of “maintenance” of the standards. There are several elements to be considered here including continuity of effort, data collection post publication and how to set this up to minimize lost information as new information becomes available. Manning and scheduling maintenance teams will be a key element in responding to use of first edition standards.

E Action plan

1. Work with the CAB/WG 15 to develop conformity for the TC-114 standards.

2. Establish Project teams and advance the development of Electric Power, Ocean Thermal Energy Conversion, and wave scale model testing.

3. Progress the PT effort for WEC performance assessment in a second location.

4. Develop a methodology to initiate maintenance for published standards

5. A Liaison shall be established with the International Towing Tank Conference (ITTC) in support of the scale model guidance development.

F Useful links to IEC web site

TC 114 dashboard giving access to Membership, TC/SC Officers, Scope, Liaisons, WG/MT/PT structure, Publications issued and Work and Maintenance Programmes and similar information for SCs, if any.

Name or signature of the secretary

Danny Peacock