ICES WGMRE REPORT 2014

SCICOM STEERING GROUP ON HUMAN INTERACTIONS ON THE ECOSYSTEM

ICES CM 2014/SSGHIE:05

WGMBRED, WGMME, BEWG, WGMPCZM, SCICOM

First Interim Report of the Working Group on Marine Renewable Energy (WGMRE)

31 March – 3 April 2014

Pasajes, Spain

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2014. First Interim Report of the Working Group on Marine Renewable Energy (WGMRE), 31 March – 3 April 2014, Pasajes, Spain. ICES CM 2014/SSGHIE:05. 14 pp.

Contents

Executive summary

The first meeting of this new Working Group took place from 31 March to 3 April 2014. It was hosted by AZTI in Pasajes, Spain. There were 9 attendees, 6 from the United Kingdom and one from Ireland, Spain and Portugal respectively. For the Group to deliver advice that has impact, and is truly representative of the ICES community, it will require representation from a larger number of ICES member countries. Improved representation through communicating the work of the Group throughout the ICES community is needed. It is hoped that the first topic based Workshop will assist in this regard.

The Group agreed that the first topic based Workshop would focus on methodological requirements to inform cumulative assessments of the effects of both climate change and marine renewable energy upon populations of marine predators afforded species protection (e.g. under the Birds and Habitats Directives). Climate change is considered to be likely have a dominant effect upon several populations of marine predators, making it highly relevant for any cumulative impact assessments. The workshop will address the methodological basis for:

- analysis of relatively small scale datasets over large spatial scales (clustered data);
- the spatial and temporal scales of analysis;
- ecosystem level food web interactions and the likelihood of change;
- quantifying the risk of change to populations of marine predators of conservation value, and the associated uncertainties;
- Providing options for interpreting a modelled framework that enables regulators to account for risk, depending upon societal acceptance of risk of change and the associated uncertainties.

A flyer for the Workshop, which is scheduled to take place in autumn 2015 will be produced by August 2014. The flyer will also promote attendance at the next Working Group meeting, taking place from 31 March to 2 April in Swansea, Wales, UK, where detailed planning of the Workshop will occur.

The Working Group also agreed the approach and format for providing annual updates that report on new science that has utility in the context of regulating the potential environmental impacts of marine renewable energy.

1 Administrative details

Working Group name

Marine Renewable Energy

Year of Appointment: 2014

Reporting year within current cycle: 1

Chair:

Finlay Bennet, United Kingdom

Meeting venue:

Pasajes, Spain

Meeting dates:

31 March – 03 April 2014

2 Terms of Reference a) – z)

ToR a) Provide summaries of the state of development of the marine renewable energy sector, covering offshore wind energy, in-stream tidal energy, wave energy and tidal barrages, updated on an ongoing basis, and including 'horizon scanning' to identify future issues for marine environmental management

Background:

- Science Requirements: the marine renewable energy sector is rapidly emerging as a new user of marine space. There is a need for up-to-date, spatially explicit information on developments and on current research activities to determine potential interactions with ecosystems and other sea users.

Advisory Requirements:

- advice to OSPAR and other customers requires access to latest research outcomes and experience of developments in this emerging science area.
- Requirements from other EGs: marine renewable energy developments will impact or interact with topics considered by other EGs, for example marine mammals, seabirds, benthos.

Deliverable: Live documents, database system and GIS outputs on marine renewable energy developments and associated research, updated and extended annually.

ToR b) Report on developments in consenting procedures for marine renewable energy

Background: As for ToR a) above.

Deliverable: Live document, updated and extended annually.

ToR c) Report on the development of decision-support and management tools for planning and regulation of marine renewable energy developments, considering the relevance to new technology, cumulative effects and the application of risk-based ecosystem approaches to management

Background: As for ToR a) above.

Deliverable: Live document, updated and extended annually.

ToR d) Identify cross-sectoral issues involving marine renewable energy, for example opportunities for co-location, interactions with fishing, aquaculture, fisheries and Marine Conservations Zones

Background: As for ToR a) above.

Deliverable: Individual fact sheets on expected interactions and issues by sector, for use by other EGs and ICES customers. Produced in year 2.

ToR e) Foster strong collaborative working relationships with other ICES Expert Groups, integrating recommendations across topic areas and identifying priority issues and science applications for thematic ICES Workshops based on regulatory and planning needs in relation to marine renewable energy

Background: As for ToR a) above.

Deliverable: Links established during year 1, Workshops held during years 2 and 3, Cooperative Research Reports (CRRs) produced as Workshop outputs.

3 Summary of Work plan

Year 1

- Agree the form of report, database and GIS outputs for ToR a, integrating information collated by SGWTE on development and research activities.
- Draft summary reports on consenting processes and decision support tools by country (ToRs b & c).
- Invite chairs and members of other EGs to participate in the WG meeting and otherwise identify cross-cutting issues; review relevant material in other EG reports.
- Propose the first topic-based Workshop, jointly with one or more other EGs.
- Review multi-annual ToRs for years 2 and 3 and adjust as appropriate.

4 List of Outcomes and Achievements of the WG in this delivery period

- This was the inaugural meeting of the WG.
- Proposed the first topic-based workshop to take place in 2015. Topic would be methodological development to inform assessment of effects of both climate change and marine renewable energy upon populations of marine predators afforded species protection (e.g. under the Birds and Habitats Directives). To enable effects of renewables projects to be assessed against a baseline that includes effects of climate change. The workshop will focus on development of mechanistic modelling methods, at relatively large spatial scales and applying methods that seek to maximise the utility of analysing data sets that are spatially and temporally clustered i.e. nested data.

5 Progress report on ToRs and workplan

Progress by ToR

Each ToR was reviewed. The utility and practicality of each ToR was considered. Changes and edits to ToRs are identified below.

ToR a) Provide summaries of the state of development of the marine renewable energy sector, covering offshore wind energy, in-stream tidal energy, wave energy and tidal barrages, updated on an ongoing basis, and including 'horizon scanning' to identify future issues for marine environmental management. The expected deliverables identified: live documents, database system and GIS outputs on marine renewable energy developments and associated research, updated and extended annually.

Progress: Working Group members noted the summaries developed by SGWTE, and agreed to provide annual updates of environmental research into the effects of marine renewables, and best available techniques for assessment – particularly in the context of regulatory requirements. The Working Group considered the utility of creating a database system, and were joined by Hans Mose Jensen - ICES Data Systems Analyst for a discussion on this topic. It was concluded that a database system and GIS outputs would not be created for the following reasons:

1) It would involve an element of duplication given that there are existing databases e.g. OSPAR database on offshore wind, 4C-offshore. Existing databases have clear attributes for organisation of metadata and spatial data.
2) End users and utility of creating a database were not clearly defined.
3) Resources to host a database within ICES were not in place.
4) Discussion with commercial providers had indicated that they would be prepared to expand their existing databases to cover all forms of marine renewables if there was demand.

Nevertheless, the Working Group concluded that a review of the existing databases would be important to understand the kind of information that has been made available on environmental impacts of MRE. An action plan was proposed to be developed during the three years which is based on four main actions:

Action 1: Identification of existing databases for MRE environmental effects

Action 2: Database description according to relevant criteria

Action 3: Identification of data or research gaps

Action 4: Reporting databases' review

A more detailed description of each of these actions is provided in Annex 4.

ToR b) Report on developments in consenting procedures for marine renewable energy. Live document, updated and extended annually.

Progress: The Working Group noted the updates provided by SGWTE and agreed to provide succinct annual updates, in the context of updated consenting procedures, where this is relevant to the science underpinning assessments. Procedural change that has no effect on science needs will not be considered.

ToR c) Report on the development of decision-support and management tools for planning and regulation of marine renewable energy developments, considering the

relevance to new technology, cumulative effects and the application of risk-based ecosystem approaches to management. Live document, updated and extended annually.

Progress: The Working Group considered that there are current gaps. In Europe, the limiting factor for the scale of development is the assessment of potential impacts to species afforded site based protection under the Natura (Birds & Habitats) Directives. Examples include the cumulative effect of collision risk upon Sandwich tern (*Sterna sandivicensis*) in The Wash, and great blacked-backed gull (*Larus marinus*) in Moray Firth, and the potential risks of collision with underwater turbines by harbour seals (*Phoca vitulina*) in the Pentland Firth area. Currently, cumulative effects assessments do not consider the effects of climate change, particularly at larger spatial and temporal scales. Any risk-based approach that accounted for ecosystem and food-web change on predator populations, could form an important baseline for then assessing the effects of renewable energy developments, particularly at larger spatial and temporal scales. It was agreed that development of this ToR through a Workshop to be held in 2015, to address appropriate methodologies, would be a priority for WGMRE.

ToR d) Identify cross-sectoral issues involving marine renewable energy, for example opportunities for co-location, interactions with fishing, aquaculture, fisheries and Marine Conservations Zones. Individual fact sheets on expected interactions and issues by sector, for use by other EGs and ICES customers. Produced in year 2.

Progress: Working Group did not address this ToR.

ToR e) Foster strong collaborative working relationships with other ICES Expert Groups, integrating recommendations across topic areas and identifying priority issues and science applications for thematic ICES Workshops based on regulatory and planning needs in relation to marine renewable energy. Links established during year 1, Workshops held during years 2 and 3, CRRs produced as Workshop outputs.

Progress: Andrew Gill, co-chair of WGMBRED attended the meeting. WGMRE members will seek to establish and retain an overview of ICES advice on impacts of marine renewable energy, through review of advice being provided by groups and active participation where feasible. WGMRE would seek to promote co-ordination and consistency across working groups. The topic based workshop will seek to foster collaborative working across disciplines within the ICES community.

Changes/ Edits/ Additions to ToR

ToR a) Provide summaries of the state of development of the marine renewable energy sector, covering offshore wind energy, in-stream tidal energy, wave energy and tidal barrages, updated on an ongoing basis, and including 'horizon scanning' to identify future issues for marine environmental management. The expected deliverables identified: live documents, ~~database system and GIS outputs~~ on marine renewable energy developments and associated research, updated and extended annually.

It was agreed by the working group to recommend to SSGHIE that the objective of creating a database system and GIS outputs is removed from the ToR.

Cooperation with other WG

- We have identified a number of other ICES working groups covering various aspects of the need to understand and manage the effects of marine renewable energy

- WG on Marine Mammal Ecology, WG on Seabird Ecology and the Working Group on Marine Benthal and Renewable Energy have all given consideration to the effects of marine renewable energy projects.
- Diadromous fish: these include the Working Group on Eel (WGEEL), WG on North Atlantic Salmon (WGNAS), WG on Baltic salmon and trout (WGBAST) and a new WG on Sea Trout. It is believed that all of these groups include some considerations of the effects of marine renewable energy devices on the relevant fish groups. Alternatively these groups may be able to provide information or expertise of relevance to this working group. Cefas has members on each of these groups. Daniel Wood (Cefas) will further investigate the remits of these working groups and WGMRE will seek to promote cooperation and avoid duplication.

Cooperation with Advisory structures

Nothing noted.

Science Highlights

- WGMRE members are contributing to an OSPAR commissioned review of the environmental effects of wave and tidal energy. Cefas (Daniel Wood and colleagues) are leading on a similar review as part of the EU funded project MaRVEN. The MaRVEN project (which focuses on Environmental Impacts of Noise, Vibrations and Electromagnetic Emissions from Marine Renewables) includes a review of the environmental effects of offshore renewable energy devices.
- The scope of the MaRVEN project review includes wave and tidal energy devices. The spatial scale of the MaRVEN review covers both the ICES and OSPAR regions. The review produced in the MaRVEN project is due for delivery in September 2014. The document reviewed intersessionally by WGMRE members to meet the purposes of ICES and OSPAR and updated as appropriate before submission to OSPAR in February 2015. The chapter structure for the review was defined at the working group meeting. Work on the review itself has also begun.

6 Revisions to the work plan and justification

Year 2

- Update and extend ~~database, GIS outputs and~~ reports on ToRs a, b & c.
- Based on collaborations with other EGs, develop fact sheets on cross-sectoral interactions.
- Plan and hold the first topic-based Workshop, with the outcome reported as a CRR.
- Propose the second topic-based Workshop, jointly with one or more other EGs.
- Review progress against multi-annual ToRs and adjust as appropriate for year 3.

Work on a database and GIS outputs was removed, following agreement that practicality and utility of delivering a product through ICES was not required as it already exists in a variety of sources.

7 Next meetings

Next meeting will be held on 31 March – 2 April 2015, hosted by Dr Ian Horsfall, location: Swansea University, Wales, United Kingdom.

Annex 1: List of participants

NAME	ADDRESS	PHONE/FAX	EMAIL
Teresa Simas	WavEC Offshore Renewables Rua Jerónimo Osório, 11, 1º andar, 1400-119, Lisboa Portugal	Tel: +351-218482655	teresa@wave-energy-centre.org
Anne-Marie O'Hagan	University College Cork, Pouladuff Road, Togher, Cork, IRELAND	**Tel:** +353 21 4250015	A.OHagan@ucc.ie
Beth Scott	University of Aberdeen Tillydrone Avenue, Aberdeen, AB24 2TZ UK	Tel 44 (0) 1224 273257	b.e.scott@abdn.ac.uk
Juan Bald	AZTI-Tecnalia, Marine Research Division,Muelle de la Herrera, s/n. Recinto portuario. Pasajes (Gipuzkoa), Spain	T. +34 667 174 437	jbald@azti.es
Ian Horsfall	Swansea University Singleton Park Swansea SA2 8PP Wales, UK	(01792) 295456	i.m.horsfall@swansea.ac.uk
Daniel Wood	Cefas, Pakefield Road, Lowestoft, NR33 0HT UK	+44 (0) 1502 524337	Daniel.Wood@cefas.co.uk
Andrew Gill	Cranfield University College Road Cranfield MK43 0AL Bedfordshire UK	+44 (0) 1234 750111 x2711	a.b.gill@cranfield.ac.uk

Melanie Broadhurst	Alderney Commission for Renewable Energy PO Box 1084, Alderney, Channel Islands GY9 3LL UK	01481 822357	melanieawt@googlemail.com
Finlay Bennet	Marine Scotland Science, Marine Laboratory, Aberdeen AB11 9DB UK	+44 (0)1224 295340	Finlay.bennet@scotland.gsi.gov.uk

Annex 2: Recommendations

None.

Annex 3: Draft chapter structure for OSPAR review of the environmental effects of wave and tidal energy

The draft chapter structure for the OSPAR review of the environmental effects of wave and tidal energy is shown below. The focus of the report will be on compiling and reviewing existing literature on environmental effects. The report will not focus identifying effects that may appear in the future i.e. where the recurrently is little or no evidence to suggest effect exists.

1. Introduction

   Aims of the report
2. Habitat loss and change effects 2
   a. Wave
   b. Tidal
3. Hydrodymanics / coastal processes 14
   a. Wave
   b. Tidal
4. Attraction effects and collision risk 19
   a. Wave
   b. Tidal
5. Avoidance and displacement effects 26
   a. Wave
   b. Tidal
6. Barrier effects 49
   a. Wave
   b. Tidal
7. Contamination effects (this section may be dropped due to lack of current evidence)
   a. Wave
   b. Tidal
8. Mitigation Measures, Monitoring & Legislation 53
   a. Wave
   b. Tidal
9. Conclusions 55
   a. Wave 55
   b. Tidal 55
10. References 55
11. Annexes 55

Annex 4: Review of existing databases on MRE environmental effects

Although it was agreed that the creation of a new GIS based database on MRE environmental effects would be useless, considering that already exists international initiatives in this sense and thus the duplication of work, there was a consensus that an identification and compilation of databases' main attributes would be important to guide potential users on the most suitable type of source of information for their purposes. The action plan proposed herein is based on this agreement and intends to provide a mechanism for databases' review, to inform potential users and support conclusions on data and research needs.

Action 1: Identification of existing databases for MRE environmental effects

A number of databases are available through the internet e.g. Thethys, SOWFIA, EMODnet, FERC eLibrary, etc. The main task under this action will be to identify the most relevant databases on MRE environmental effects and understand their purposes, in order to describe the level of detail of the information provided as well as their contents.

Action 2: Database description according to relevant criteria (include a brief description of each criteria range of classification)

This action will be carried out together with Action 1 and intends to provide information on database attributes. A fact sheet will be created for each database considering the following criteria (which could be extended or modified depending on the information gathered during Action 1):

- MRE type (wind, wave, tidal, OTEC? and salinity gradients?)
- Data quality (use of ISO standards?)
- Geographic scope
- Data viewer platform (yes or no)
- Type of information (metadata, raw data, reports, papers, etc)
- List of parameters (physical, biological, socio-economic)
- Is being updated in a regular basis? (yes or no)
- Other information: website, name and contact of the database manager.

The final output will be and excel sheet with filters comparing databases to help choosing the most appropriate database (depending on the user's interest).

Action 3: Identification of data and research gaps in the information provided by the databases. This action should be carried out considering the work developed in ToR a) science and advisory requirements and ToR b) and c).

Action 4: Review of new and relevant information provided by each database through an annual report.

Actions 1 and 2 are going to be carried out until the end of the first year and action 3 and four during the three years and after the first two actions have been completed.

Annex 5: Developments in consenting procedures for marine renewable energy

Sustained usefulness of country reports

All previous SGWTE reports contained country reports for each participant country in the SGWTE meeting. These country reports updated readers on progress on Ocean Energy (OE) projects (wave and tidal only), planning and consenting processes, roadmaps or related strategic planning documents as well as operational decision support tools. Whilst this information may still prove useful to certain parties, participants at the inaugural WGMRE were of the opinion that the utility of continued reporting on these matters was limited. This can be attributed to a number of factors listed below:

1. Changes to planning and consenting processes may not have an impact on science underpinning assessment of the environmental impacts of MRE developments hence should not be a specific focus area of WGMRE;
2. Consenting processes for MRE are largely established and not changing as frequently as previously hence information provided under this ToR may become repetitive;
3. Information on consenting processes is widely available elsewhere, specifically on the websites of relevant Government and agencies (such as Marine Scotland) and also in numerous project reports (e.g. the SEAENERGY project http://www.seanergy2020.eu/ and more recently the SOWFIA project http://www.sowfia.eu/);
4. The International Energy Agency's Ocean Energy Systems (IEA-OES) Annex IV database *Tethys* has a section dedicated to regulatory frameworks, accessible at http://tethys.pnnl.gov/regulatory-frameworks, where information on consenting processes and links to further information can be found. This includes a number of ICES Member Countries.

Risk-based frameworks

Previous SGWTE work examined structured approaches to risk analysis and ecosystem based management of marine activities and supported the development of Bow-Tie diagrams, as put forward in the related ISO 31010 handbook, for other ICES countries. A detailed risk analysis frame-work was then put forward as an ICES Co-operative Research Report (Cormier *et al.*, 2013). Subsequently Marine Scotland reviewed the ICES CRR to identify the strengths and limitations of the Ecosystem-based Risk Management Framework (EBRMF) that it describes with respect to the management of the environmental impacts of the marine renewable energy industry within Scottish waters (see ICES SGWTE Report, 2013). Following consideration of work on this area to date, the WGMRE were of the opinion that in practice qualitative judgements, particularly in relation to spatial scale, associated with the framework put forward in the CRR did not necessarily fit with the assessments needs for marine renewable energy developments (ecosystem risk v. site risk). However, the need for a risk-based approach to consenting was widely supported by the WG members.

Obligations deriving primarily from European and national legislation on nature conservation, protected species and habitats and broader marine environmental protection, often require environmental assessment processes at varying scales: SEA and MSFD at regional level, EIA at site level and Appropriate Assessment at species/habitat level are merely a few examples of the assessments that can apply. In

some situations this can impact upon the flexibility a regulator can adopt when assessing applications for project consents. Accordingly some Member States of the EU, namely the UK and Scotland in particular, have adopted a risk-based approach to consenting where the level of survey required is based on the environmental sensitivity of the proposed development site, the risk profile of the technology and the scale of the proposed project. This is applied to prototype and first iteration devices and arrays and their deployment into the marine environment. The rationale is the capacity, scope and survivability of these devices must be demonstrated *in situ*, so that the sector can progress sufficiently to attract the support necessary to enable the sector to advance to commercial scale. An added value of the risk-based approach is that it can assist in homogenising environmental risk assessment and the data gathering associated with this so any recommendations put forward are based on best available science and evidence from practical experiences. Over time adopting a risk-based approach could contribute to reducing costs of, and time taken for, consenting. Marine Scotland have captured the essence of this approach in their published Survey Deploy and Monitor guidance for wave and tidal energy developments (2012).

References

Cormier, R., Kannen, A., Elliott, M., Hall, P., Davies, I.M. (Eds.). 2013. Marine and coastal ecosystem-based risk management handbook. ICES Cooperative Research Report No. 317. 60 pp. Available from: http://www.ices.dk/sites/pub/Publication%20Reports/Cooperative%20Research%20Report%20(CRR)/crr317/CRR317%20Marine%20and%20coastal%20ecosystem%20based%20risk%20management%20handbook.pdf

ICES. 2013. Report of the Study Group on Environmental Impacts of Wave and Tidal Energy (SGWTE). 19-21 March 2013, Cork, Ireland. ICES CM 2013/SSGHIE:06. 320 pp.

Marine Scotland / Scottish Government. 2012. Survey, deploy and monitor policy guidance. Scottish Government, Edinburgh

http://www.scotland.gov.uk/Topics/marine/Licensing/marine/Applications/SDM