

# Environmental Acceptability of Marine Renewable Energy Devices - Workshop

September 2025

Workshop report from the

European Wave and Tidal Energy Conference, Madeira, Portugal

## Background

Environmental research and monitoring for marine renewable energy (MRE) devices is important to understand the potential effects that will drive permitting and licensing decisions. OES-Environmental began exploring “environmental acceptability” as a concept to avoid and limit the risk of harm from MRE devices to the marine environment. Environmental acceptability is defined by OES-Environmental as “guidance that will allow for harnessing MRE resources efficiently while limiting risks to the environment (marine animals, habitats, ecosystems), assuring compliance with environmental regulations, and promoting environmental benefits.” OES-Environmental is currently examining wave and tidal energy devices and their supporting infrastructure to understand component-level environmental risks, identify opportunities to improve the environmental acceptability of marine renewable energy (MRE), and assess potential induced environmental benefits. This information will be used to provide tailored advice to developers, regulators, and stakeholders for MRE device design and selection, project planning, deployment, and operations.

In September 2025, OES-Environmental hosted a workshop at the European Wave and Tidal Energy Conference (EWTEC) in Madeira, Portugal, to discuss the environmental acceptability of MRE devices. The workshop began with brief introductions that were followed by a presentation on the environmental acceptability of MRE devices. The presentation began with an overview of OES-Environmental, a summary of the current knowledge on environmental effects of MRE, and a description of the information needed to apply the concept of environmental acceptability to MRE devices. Following the presentation, two use cases were presented: tidal energy and collision risk, and wave energy and underwater noise. Workshop participants were then engaged in a guided group discussion to address opportunities and challenges for the environmental acceptability process for each of the use cases.

This document summarizes the discussions held by the workshop participants for the two use cases. Twenty-two people from a variety of international organizations representing 13 countries attended the workshop. The attendee list is available in Appendix A and the responses to an online post-workshop survey are available in Appendix B.

## Discussion

Breakout discussions centered on two hypothetical use cases: 1) a generic wave energy converter and the potential for underwater noise effects on marine life, and 2) a generic tidal energy device and the potential for collision between a turbine blade and marine animal. Participants were asked to frame their discussions around three phases of MRE development: project planning, device design, and device deployment and maintenance. Discussion questions included:

- What can be done at the planning stage to assure the device/project is environmentally acceptable?
- What design changes can be made to a device?
- What should be considered before deploying a device?
- What monitoring methodologies could you use to maintain the environmental acceptability of the device?
- What mitigation measures can be considered?
- What does the environmental acceptability of a device/project mean to you?
- What makes a MRE device/project more environmentally acceptable?
- What would you need to integrate the concept of environmental acceptability into your current work?

### Wave Energy and Underwater Noise

The wave energy use case discussion started with considerations around project planning. Participants stressed that careful site identification is key to minimizing impact, particularly maintaining a safe distance from sensitive habitats for benthic species and marine mammals. Assessing species that might be sensitive to underwater noise from a wave energy device at or near the project site is important at the early planning stage, especially those that fall under certain regulations or protections. Participants also encouraged stakeholder engagement and transparent and consistent communication early on and throughout the planning process to promote trust and collaboration.

The discussion then shifted to considerations during the design phase for a wave energy project. Decisions about mooring system materials and anchor solutions should be adapted for specific site and species considerations and environmentally friendly designs should be considered to reduce the potential for long term effects. Early in the design process, supply chain partners should be integrated into environmental considerations and design decision-making.

Underwater noise is often most significant during the installation phase, particularly from vessel noise. Mitigation measures to limit potential effects include reducing vessel time at sea during installation operations and limiting activities to specific times or seasons to protect sensitive species. During installation, real-time monitoring of the noise produced and animals present in the area is critical, allowing operations to be halted if risk of harm is present and resumed when the risk has passed. Another consideration is tank testing of the device prior to installation in the ocean, allowing for noise levels to be measured and validated prior to placement.

## **Tidal Energy and Collision Risk**

The tidal energy use case discussion also began with considerations around project planning, including identification of species in the area; considering their seasonal distribution, migration patterns, and abundance; assessment of existing risks in the area; and assessment of potential future risks if the project is successfully deployed. Participants also discussed the need for animal presence and hydrodynamic data at the site prior to evaluating risks. Lack of public data and standards for MRE deployment and monitoring make considerations of environmental acceptability difficult. Participants stressed the importance of considering stakeholders and community engagement during the planning process.

When designing a project, it is important to consider environmental concerns early in the process rather than having to redesign the device later. If a device needs substantial changes to be considered environmentally acceptable, it may be easier to change the technology type rather than redesigning specific structures and components. Participants discussed the willingness of technology developers to collaborate in the research process; however, if design changes impact power performance, they may be less amenable. Regulatory requirements are important to consider in the design phase, but may be challenging for developers to navigate, as requirements often change.

Workshop participants discussed the potential benefits of tidal deployments and suggested that they might be dependent on the ecosystem in which the device is deployed. One challenge to understanding and promoting benefits might be a limited understanding of the environment. Monitoring data and historical knowledge of the area and species present could promote better understanding of potential benefits. However, participants cautioned that promoting co-benefits beyond energy generation may be risky, as some benefits are uncertain.

## **Additional Feedback**

OES-Environmental gathered additional feedback from workshop participants using a brief, online survey to compile ideas for an environmental acceptability tool that might be useful for developers and regulators. Suggestions included developing a collision risk model for different tidal rotor types; a tool that highlights concerns of devices at early development stages and potential solutions; a tool that includes information on international regulation requirements; and a tool that allows users to specify the technology type, location, and size of device to generate a list of potential risks, estimate their severity, and advise on mitigation.

## **Next Steps**

OES-Environmental will leverage the input from the workshop to further develop the environmental acceptability process and an interactive tool for developers and regulators. The tool will provide guidance to support the implementation of environmental acceptability during the planning, design, and deployment phases of an MRE device.

## Appendix A – Attendee List

Attendee names have been removed for confidentiality and the number of attendees from each organization is noted in parentheses if more than one representative participated in the workshop.

Organization	Country
University of Western Australia	Australia
University of Victoria	Canada
LUT University Finland	Finland
TU Braunschweig	Germany
University College Cork / MAREI (2)	Ireland
Vanuitelli University	Italy
Politecnico di Torino	Italy
Haskoning	Netherlands
National Institute of Water	New Zealand
WaVEC (2)	Portugal
PLOCAN (2)	Spain
BIMEP	Spain
Uppsala University	Sweden
Blackfish Engineering	UK
EMEC (2)	UK
Proteus Marine Renewables	UK
University of Oxford	UK
Fenner Dunlop	US
Aquatera Ltd (3)*	UK
Pacific Northwest National Laboratory*	US

\* Workshop organizers.

## Appendix B – Post-workshop Survey Responses

Q1 – How would you rate the workshop?

- Very Good – 1
- Good - 1

Q2 – What did you like about the workshop?

- I appreciate the fact that it focused on two specific impacts, which provides the opportunity to explore that theme in greater depth.
- It was great to have an open constructive conversation with people from a range of backgrounds.
- The fact that there was a workshop.
- Sitting in a circle made the discussion feel very personal and it felt like everyone could input equally, which I thought they did. I liked how open ended the discussion was as it allowed people from broad backgrounds to contribute without excluding anyone.

Q3 – What did you dislike about the workshop?

- Unfortunately there was not enough time to discuss plenty on both topics and that it was organized at the end of the day which most of people were tired or didn't want to participate.
- Was a shame it was cut short but not your fault! It could have been an all day workshop.
- I may have been in the wrong place, but the discussion was not about how to regulate the environmental issues.
- I appreciate that it was at the end of the day and energy was low and time was limited, but if it was able to start earlier, I would have appreciated it going on for longer, it felt like we had to cut it short just as the discussions were properly getting started.

Q4 – What tools or products you would like OES-Environmental to create?

- I believe that a tool which highlights the main impact-related concerns of marine energy devices at the early development stages, along with possible solutions, would support better development, especially if directed toward private stakeholders.
- Could consider the practicalities of developing a collision risk model for different rotor types; e.g., vertical axis, horizontal axis
- International regulations and access to it.
- Some form of a tool that would identify the key marine risks associated with a project. For example, if you input the location of a project, the type of technology proposed to be installed, and then the size/scale of it, the tool provides a list of potential risks to the environment, estimates their severity, and advises on how to reduce the impacts.

Q5 – What other topics would you like to see addressed in future workshops?

- I would really like to start discussing cumulative impacts at a more general level, focusing on diverse anthropogenic pressures (not only related to marine energy) for each specific key stressor–receptor pair. I also think it would be very interesting to discuss impact of arrays, even though obtaining reliable data for them can be challenging.
- Think the topics of collision risk and UWN are the key aspects and warrant more discussion. Other topics could include seabed effects from nearfield changes in hydrodynamics; H&S hazards (perceived hazards) for sea users e.g. kayakers etc.
- More of a discussion about accepting risk rather than avoiding or mitigating it.

Q6 – Do you have any additional feedback for the team?

- The existing tools are great!