

De-risking consenting of tidal energy arrays – are we nearly there yet?

Workshop report from the Marine Energy Wales online side event
29th January, 2021

1. Background

The tidal stream energy industry is at a significant moment, as it moves towards deployments of larger arrays. This critical step represents more than 15 years of research and innovation funded by the UK and devolved governments and industry, with direct involvement of regulators and their advisors, to facilitate device development and testing as well as evidence and tools to support consenting. Nevertheless, barriers in Europe to progressing to commercial arrays are leading industry to see opportunities overseas, including Canada and South East Asia. While some of these barriers relate to revenue support for the sector, there remains a pressing need to collaborate to resolve consenting issues to progressing larger projects in the UK.

This workshop followed on from one held in 2019, also focusing on Welsh tidal energy consenting. Since the 2019 workshop, significant progress has been made by the sector in Wales, backed by high level political support and dedicated European Regional Development Funding (ERDF). A recent emphasis placed by Welsh Government on the importance of the marine energy sector in contributing to Wales' COVID-19 Green Recovery meant that this workshop was timely. The outcomes of this workshop will feed into: the Welsh Consenting Strategic Advisory Group and Science and Evidence Advisory Group for marine renewables; a series of consenting guidance documents by Ocean Energy Systems Environmental (OES-Environmental); and the ongoing work of Offshore Renewables Joint Industry Programme (ORJIP) Ocean Energy in reducing the uncertainty around the environmental effects of tidal energy developments.

2. Event Description

As a side event to the online 2021 Marine Energy Wales conference, ORJIP Ocean Energy and the Supergen Offshore Renewable Energy hub hosted an interactive workshop focusing on the key environmental consenting risks that persist for tidal stream arrays. The workshop included presentations from the Marine Energy Council, Natural Resources Wales (NRW), ORJIP Ocean Energy, OES-Environmental and key tidal energy developers in Wales, with focussed breakout discussion sessions.

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The specific aims of this workshop were:

- to highlight key environmental evidence gaps associated with consenting for tidal energy arrays in Wales;
- to identify steps towards addressing high-priority evidence gaps and key stakeholders who must be involved; and,
- to identify pathways for de-risking tidal energy array consenting as evidence gaps are addressed.

An international audience of over 70 participants from across the sector attended the workshop, including individuals from across the UK, Europe, and North America. Participants represented industry, academia, government and regulatory bodies, statutory advisors, NGOs and other stakeholders to the tidal stream sector.

3. Programme

A programme for the workshop held on 29th January 2021 at the Marine Energy Wales conference can be found below (Table 1).

Table 1: Programme for Marine Energy Wales workshop on tidal energy consenting risks

Time	Item	Speaker
14:30	Welcome and introductory comments	Jennifer Fox
14:35	Ocean Energy Critical Evidence Needs – overview of ORJIP Ocean Energy report	Jennifer Fox
14:50	Scene setting- where we are in the political and funding landscape for wave and tidal energy	Sue Barr
15:05	Perspective from Natural Resources Wales – challenges and opportunities in decision making for consenting	James Moon
15:20	Break out group session 1 Discussion questions: - How can/ should the critical evidence gaps be addressed? - Are there key evidence gaps that are more/ less relevant in Wales? - Where are the key challenges in addressing these gaps and how can these challenges be addressed?	Facilitators include Jennifer Fox, Sue Barr, Kate Smith, Raeanne Miller, Beth Scott, Catherine Tait, Andrea Copping, Mikaela Freeman
15:50	Break and networking via Chat	
16:05	Industry perspectives on consenting challenges and developments in Welsh waters: Nova Innovations, META, MeyGen, QED Naval, Minesto	Kate Smith, Saul Young, Fraser Johnson, Jeremy Smith, David Collier
16:50	Risk Retirement & production of Guidance Documents – OES-Environmental	Andrea Copping & Mikaela Freeman

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17:15	Break out group session 2 Discussion questions: - How can guidance documents be used in Wales? - What are the challenges and opportunities for risk retirement? - What role can regulators play in risk retirement and guidance documents?	Facilitators will include Jennifer Fox, Sue Barr, Kate Smith, Raeanne Miller, Beth Scott, Catherine Tait, Andrea Copping, Mikaela Freeman
17:45	Report out from discussion session & next steps	All
18:00	Close	

Each breakout group was assigned a facilitator to manage discussions, and to ensure that key points were captured on a Google Jamboard (www.jamboard.google.com). All participants were able to contribute notes on the Jamboard, and facilitators captured any further points that had been missed. The Jamboards were closed to further editing and downloaded after the workshop.

4. Workshop outcomes

4.1 Overarching themes

Four overarching themes were consistently discussed throughout the workshop, both by participants in breakout groups, and by those presenting. These overarching themes are briefly summarized below.

Theme 1: The scarcity of array deployments and the challenge of scaling up. Few tidal energy devices have been deployed for long durations, and only a handful of small arrays have been installed. This limits evidence from deployments to information collected at only a few sites, and often for short durations (with some exceptions). This creates challenges associated not only with uncertainty in environmental effects (particularly in the long term), but also with restricted opportunities for testing new and more cost-effective monitoring technologies, tools and techniques which curtails their development and keeps costs high. Uncertainty in terms of environmental risk makes consenting further developments or scale-up challenging. The Scottish Government’s incremental ‘Survey, Deploy, and Monitor’ approach was noted as a helpful strategy for enabling developments to proceed, although it places a significant burden on industry first movers in the development of arrays. Accelerating consenting of further small-scale arrays could provide opportunities to improve the evidence base and increase the reliability of monitoring tools and techniques, thus bringing costs down for individual developers.

Theme 2: Technical development. The environmental evidence gaps associated with tidal energy developments are complex and multi-faceted. Research and monitoring technologies, techniques, and protocols must continue to be developed to grow the scientific evidence base for consenting, to improve the reliability of monitoring technologies and to enable the transfer of knowledge between development locations or tidal technologies, bringing down the cost of monitoring and LCOE. New cost-effective sensor platforms should continue to be developed and robustly evaluated in order to address evidence gaps.

From the perspective of developers, setting up monitoring programmes is expensive, and increases the levelised cost of energy (LCOE). Consequently, the onus on developers to resource monitoring programmes is a barrier to market penetration. As ever, collaboration and co-funding of research and development will continue to be important to reduce the financial burden on developers and to

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enable the research community's work to be relevant for regulators and realistic for developers. Research groups must collaborate across receptor types to enable simultaneous data collection to address multiple needs, while developers and regulators must be involved to enable testing and validation of new technologies in 'real world' environments, and to ensure that the data collected meets regulatory needs.

Theme 3: Data availability and transferability. Data availability and transferability remain challenges across the tidal energy sector from the perspectives of researchers, developers, and regulators. Further research efforts need to focus on critical gaps which will have a material influence on the outcome of consent decisions, for example those highlighted in the ORJIP Ocean Energy Critical Needs Report¹. The lack of tidal energy site-specific data means that there may be benefits in drawing down data or knowledge collected for other purposes, for example in association with other parts of the maritime sector. Where data does exist, standardisation of data collection and sharing and storage protocols would assist with data transfer and comparison between development sites, and along with anonymisation and omission of operational details, could also help to address some of the data-sharing challenges associated with intellectual property. Further opportunities for overcoming barriers in data sharing and transferability have been highlighted in the ORJIP Ocean Energy report on Sharing Environmental Monitoring Data².

Theme 4: Communication and knowledge transfer. All breakout groups highlighted the need for better communication across stakeholder groups in the tidal energy sector to ease the process of knowledge transfer between sites and regions. Although there are still significant gaps, the scientific evidence base for tidal stream energy continues to grow, and it is important that the tidal energy community (regulators, academia, industry) work together more closely to apply the evidence that is available to de-risk consenting. Improved communication between stakeholders would also help to develop common understanding around issues including: timeframes, costs and responsibility for development and implementation of monitoring plans; familiarity with the evidence base; industry sharing of data, and varied attitudes towards development of guidance documents, tools, and techniques for managing risk and uncertainty.

Detailed outcomes of the workshop can be found in sections 4.2 to 4.5.

4.2 Evidence gaps for Wales

Numerous evidence gaps were highlighted as being important to address in order to advance tidal energy in Wales. Risk of collision between devices and mobile species was consistently highlighted as a very important issue, with uncertainty about the near-field behaviour of mobile animals in the vicinity of turbines a key uncertainty to resolve. A summary of evidence gaps and key questions that were commonly identified in breakout groups is provided in the table below (Table 2).

¹http://www.orjip.org.uk/sites/default/files/ORJIP%20Ocean%20Energy%20critical%20evidence%20needs%20document_V2.pdf

²<http://www.orjip.org.uk/sites/default/files/ORJIP%20Ocean%20Energy%20%20Sharing%20Environmental%20Monitoring%20Data%20V2.pdf>

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Table 2: Evidence gaps and associated key questions frequently highlighted by workshop breakout groups

Evidence gap	Key questions
Collision risk for mobile species	<p>What is the near-field behaviour of mobile animals in the vicinity of a tidal turbine, and in the vicinity of a tidal energy array?</p> <p>What is the relative risk for different receptor groups? Are some receptor groups lower risk than others?</p> <p>How does animal behaviour change as developments scale up to small and large arrays? How does this affect collision risk?</p> <p>How does animal behaviour change as turbine diameters increase? How does this affect collision risk?</p> <p>What are the collision avoidance rates of various seabird species?</p>
Climate change	<p>How do the outputs of collision risk models change as they are updated with new data?</p> <p>What are the relative impacts of climate change in comparison with the effects of tidal energy development?</p> <p>How can we balance the global climate challenge with the equally relevant challenge of biodiversity loss and habitat degradation?</p>
Sediment transport	How do near-field blockage effects on sediment transport affect resident or nearby ecological communities?
Community engagement	How do local communities perceive and value their environment and the species within, in relation to tidal energy developments?
Baseline environment	What are the occupancy rates and population distributions of species that are important in Wales? For example those associated with SACs and SPAs.
Data transferability	<p>Given that some species and behaviours may differ across locations, how well does data and knowledge obtained at one location transfer to another?</p> <p>How does the knowledge gained from deployment of a single device scale to a small array, and to larger arrays? Do the effects scale linearly?</p>

4.3 Challenges and Opportunities

The scarcity of tidal energy deployments is a key challenge which manifests in all of the topics listed below. A lack of deployments not only means that the evidence base is currently limited, but also that opportunities for testing new tools and techniques are reduced. With this in mind, transferring learning between projects and developments is important, and should be facilitated by reliable data sources and good communication across the sector, regionally and internationally.

Addressing technical challenges

The highly energetic marine environments associated with tidal energy developments make designing environmental monitoring approaches, platforms, and sensors for these sites challenging and expensive. Participants in this workshop highlighted the particular challenge of designing monitoring programmes to detect rare events such as collision, or lack thereof, with sufficient power to rule out any regulatory concerns. With this in mind, it is important to distinguish between evidence of absence of effects, and an absence of evidence. For example, some tidal energy devices may be monitored intensively over many years, but record very few near-field animal interactions. This lack of observations makes it hard to understand animal behaviour around devices, but could also suggest that animals spend little time around operating tidal energy devices and that interactions are rare.

Many monitoring approaches and technologies currently used within the sector are well-documented and effective for obtaining particular types of environmental data but were not always considered by workshop participants to be sufficiently reliable. Continuing research and development of new

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methods, sensors and platforms for tidal energy environmental monitoring remains necessary and should complement existing measurement methods. It was also important to consider that from a developer perspective monitoring programmes are expensive, increase LCOE, and must be adequately resourced and funded. Participants highlighted that integrated research studies designed to enable comparison of new and existing technologies and methodologies would help the community to better assess which techniques are most suited to different environments or to answer different questions. For example, vantage point surveys were noted as useful for assessing animal displacement, while new technologies to track animals in three dimensions could provide better information about near-field behaviour and avoidance rates of those same animals.

Improving data availability

The lack of availability of sufficient data and knowledge for decision-making was identified by every breakout group as a key challenge to tidal energy consenting. Suggested activities to address this challenge included:

- signposting to data and resource repositories (e.g. Tethys Knowledge Base, OES State of the Science reports) from a centralised location, accessible to all parts of the sector;
- mining and application of data and knowledge from analogous industries;
- collaboration across the sector to understand how data is collected and used in consenting;
- standardisation of approaches to data collection and protocols for data sharing; and,
- anonymisation of shared data and development of a system for metadata tracking.

Participants acknowledged that the challenges associated with data availability were, in part, as a result of the limited nature of deployment to date, and that support for further deployments would enable the existing evidence base to grow. Likewise, existing relevant information was often stored in a variety of locations and databases and could be difficult to find. Signposting to some of these databases and research repositories from a central location was suggested as an opportunity to alleviate this challenge. In the absence of tidal energy-specific data, however, it was suggested that knowledge and data from other maritime industries could potentially be applied to plug some knowledge gaps.

Data transferability is an ongoing area of work for OES-Environmental³, and participants in this workshop cited the potential for data exchange and knowledge transfer between locations as both a challenge and an opportunity for the sector. A proposed first step towards enabling knowledge transfer between tidal energy locations was for developers and researchers to work together to clearly identify how different types of data are analysed and used for various purposes, and whether the sharing of raw data or analysed datasets are required for particular tasks. For example, data collection, analysis, and reporting by developers to discharge licence conditions may not align with the scope of data collection needed for research purposes. Better mutual understanding of developer and research needs would help to ensure that data collection is not only adequately resourced and funded, but is also efficient, effective and satisfies the original defined purpose. The standardisation of approaches to data collection was also identified as an important opportunity to enable comparisons between development sites, although participants noted that differing licensing conditions and reporting requirements from regulators in different regions posed a substantial challenge to such

³ <https://tethys.pnnl.gov/data-transferability>

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standardisation. It was also suggested that standardisation could help to address some of the data-sharing challenges the community faced in relation to intellectual property.

A system for metadata tracking, could be developed to increase confidence in data and knowledge transfer between sites, while in the long run anonymisation of data would also help to encourage data sharing, ensuring that sensitive, fine-scale operational data would not be released.

One ongoing initiative to make marine energy data sets more easily 'discoverable' is the OES-Environmental Monitoring Datasets Discoverability Matrix⁴. This interactive tool classifies monitoring datasets from consented (or permitted) marine energy projects and research studies for six key environmental stressors, providing improved access to scientific knowledge and information underpinning successful marine energy development consents.

Approaches to consenting

Throughout the workshop there was a general sense from participants that the 'survey, deploy and monitor' approach to consenting was the most appropriate for tidal energy development. However, several participants noted that in order for this approach, alongside adaptive management, to gain traction, they must be adapted to acknowledge that some risk cannot be eliminated, and will persist, even in small developments. It was also recognised that better frameworks for assessing risk and decision-making throughout the consenting process should be developed, for example by building contingencies in to decision-making where there is substantial uncertainty of outcomes.

Regulators expressed that at present they feel duty-bound to explore the consequences to different species and different sites, under different conditions, making risk retirement and other risk-reduction strategies challenging for them. Among other participants a desire was expressed for regulators to be more direct, providing constructive advice to proponents and more willing to decline consent at an early stage, when appropriate. It was suggested that responsibility for risk-based decisions should be taken at a higher level within regulatory bodies, and that governments could provide guidance on responsibility for risk. More broadly, communication and engagement efforts across all stakeholder groups would help to foster a common understanding of the point at which sufficient evidence becomes available for consenting risk to be reduced and for the sector to move forward.

Funding environment

The current funding environment for research and monitoring of tidal energy developments is not fit for purpose. Workshop participants highlighted that while many of the important evidence gaps required long-term research projects to be fully addressed, the current funding environment for research provides funding on shorter timescales, meaning that it is not always possible to guarantee that research will be delivered from one year to the next. Likewise, the development and oversight of monitoring programmes is expensive for developers, and represents a barrier to industry development. Policy support is needed for longer-term R&D from pre- to post-deployment stages.

The current funding environment encourages single-sector (e.g. academia or industry) access to funding, limiting collaboration between stakeholders. Participants suggested that a more collaborative model would improve transparency and enable research to run alongside live projects to test new technologies in 'real' environments, growing the evidence base.

⁴ <https://tethys.pnnl.gov/monitoring-datasets-discoverability-matrix>

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Communication and knowledge transfer

Communication and the transfer of knowledge between stakeholders, sites, regions, and internationally was highlighted as important for addressing nearly every challenge discussed in the breakout groups. Improving communication pathways and engagement across the sector would help to manage the expectations of developers, researchers, and regulators, while also improving transparency in the consenting process. Important opportunities to improve communication and knowledge transfer were:

- learning from other sectors;
- highlighting cases of knowledge transfer between projects and sectors;
- helping regulatory bodies and industry to become more familiar with the available data and evidence to enable them to assess projects more effectively;
- defining the time and resources required to design and implement effective monitoring plans;
- encouraging adoption of guidance notes and consenting tools for managing risk and uncertainty; and,
- increasing the visibility of efforts by organisations such as the Welsh marine Energy Consenting Strategic Advisory Group (CSAG), Scottish Marine Energy Research (ScotMER) and ORJIP to identify evidence gaps, particularly to funding agencies and governments.

4.4 Guidance documents

Guidance documents were identified to be a valuable resource, particularly if they served to facilitate better communication across all stakeholders and highlighted the best available scientific techniques and innovative technology. With this in mind, they should be written in accessible language, and a plan for regular updates should be incorporated into the methodology.

In some breakout groups, participants suggested that guidance documents would be most useful if they took a broad approach to environmental risk, and acknowledged that regulatory expectations and receiving environments differ for each development site and scale, even within the same region. Others commented that guidance documents would be most effective if they focused on particular sites, species, and/or development scales.

Many representatives of regulatory bodies stressed that close communication with them in developing guidance documents would be important. As decision-makers, regulators highlighted that opportunities to review and comment on guidance documents in advance of publication would help to ensure that they are relevant and applicable.

Suggestions for content for guidance documents included:

- highlighting regulatory discrepancies on particular issues, for example on the use of acoustic deterrent devices (ADDs);
- providing clarity on measures of risk;
- identification of a suite of methods for mitigating risk; and
- examples of best practice for development proponents.

4.5 Risk retirement

Risk retirement is the process of identifying interactions between small numbers of marine energy devices and animals or habitats that are unlikely to cause significant harm. Consequently, these

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interactions should not require extensive investigation for every new marine energy project. To generate consensus within the marine energy community, OES-Environmental has developed a stepwise process by which risks (or interactions) can be retired⁵. Given the diversity of species and development designs, retiring risks for specific species and individual device types may be a necessary part of the process. However, under the OES-Environmental Data Transferability Framework (see 'improving data availability' in section 4.3), if sufficient data are collected, and using data transferability guidance, it may not be necessary to examine every receptor group at every location. Rather, the aim is to identify and retire risks at locations with similar oceanographic and ecological conditions, where there is sufficient knowledge to do so.

Risk retirement was seen as an opportunity to enable research efforts and consenting to focus on the greatest environmental risks. For example, risk retirement could help to streamline the scoping process in order to focus on key issues in EIA. In Wales, the Consenting Strategic Advisory Group (CSAG) was suggested as an instrument for advancing the risk retirement process.

The process of risk retirement necessitates that all stakeholders have access to a common evidence base, and that all parties interpret the evidence base in similar ways. Also important was an agreed position on how consenting risks were tolerated at government level. With this in mind, developing a common understanding of the evidence in order to evaluate and lower the perception of particular risks was seen as a positive outcome of the risk retirement process. In particular, it was thought that empowering regulators to contribute to this process and to any associated guidance would enable regulators to develop confidence in their decision-making. This would also help to alleviate frustrations by researchers, who sometimes felt that some responsibility for consenting risk was wrongly pushed to them during the consenting process.

Risk retirement, however, was a difficult concept for many participants to grasp, in light of the uncertainty associated with tidal energy developments and the site- and technology-specific nature of many environmental risks. Participants suggested that some risks (e.g. collision) may need to be retired individually for particular species or receptors, locations, or device types, while others could likely be retired in a more general sense. Integrating cumulative effects into risk retirement was perceived to be a substantial challenge.

Some participants perceived that the term 'risk retirement' suggested that risks were no longer relevant once retired, or that there was 'no risk', when in fact 'low risk' would be a more appropriate term. Participants suggested that development of a complementary process for re-activation of risks, particularly as technology and development scale evolves, would help to alleviate these perceptions.

Finally, participants identified that achieving support from regulators in the risk retirement process is paramount, and it was suggested that this should occur before the risk retirement process starts. Regulators need to be comfortable with the responsibility associated with risk retirement and how it aligns with their statutory obligations. SNCBs and NGOs should also be made aware of this process as there was a concern that other stakeholders could challenge the risk retirement process, potentially on a legal basis.

⁵ <https://tethys.pnnl.gov/risk-retirement>

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5. Summary and next steps

The presentation and discussions at the workshop, as summarised here will feed directly into a number of ongoing programmes of work within ORJIP OE, OES-Environmental and the Welsh CSAG.

ORJIP Ocean Energy Critical Evidence Gaps

- This report⁶, published in November 2020 will be under regular review going forward. The feedback from the workshop will be included in this process.

OES-Environmental

- OES-Environmental continues to develop the risk retirement process⁷ and is engaging a wide group of stakeholders in regular seminars and workshops to disseminate their progress and to procure feedback, with the intention that the process continues to develop alongside development of the sector. To enable risk retirement to become an established process across the sector, the OES-Environmental team will continue to seek regular feedback from the community. The discussions held in this workshop will be incorporated as part of this development.
- A series of workshops will be hosted by OES-Environmental in March focusing specifically on Collision Risk Modelling for fish and for marine mammals. These workshops will provide further solution-oriented discussion on this key theme within the Critical Evidence Needs report. For further information, contact the ORJIP Secretariat at ORJIP@Aquaterra.co.uk.

Welsh CSAG

- Many of the workshop attendees are part of the Welsh Marine Energy CSAG and Science and Evidence Advisory Group. The CSAG is an appropriate forum for the continuation of discussion and action around the key themes presented in this report specifically in the Welsh context.
- The Science and Evidence Subgroup are working with Welsh Government to develop a series of Information Notes that will focus on the overarching themes drawn from discussions in the workshop (section 4.1) and in alignment with the ORJIP Critical Evidence Needs document. More information on this will be available shortly.

⁶http://www.orjip.org.uk/sites/default/files/ORJIP%20Ocean%20Energy%20critical%20evidence%20needs%20document_V2.pdf

⁷ <https://tethys.pnnl.gov/risk-retirement>