

PROJECTS FINAL REPORT		
Call round: - 2		
Project Title: Feasibility of a Marine Acoustic Sensing Network using the UK Archipelago of Offshore Renewable Energy (ORE) Infrastructure		
PI: Anna Young	Research Organisation: University of Bath	
Department: Mechanical Engineering	Start Date: 1 st March 2023	Duration 4 months
Cost of award (80%): £44,614	Value of co-investment: In kind: £0 Cash: £0	
Co-I and associated RO: Cormac Reale (Architecture and Civil Engineering), Philippe Blondel (Physics), Guillermo Jimenez Arranz (PDRA)	Acoustic Research themes: <ul style="list-style-type: none"> • Acoustics for understanding of climate change • Impact of sounds on wildlife • Sustainable acoustic solutions 	
<p>Collaborations & Partnerships involved in project: Tell us about bi-lateral or multi-lateral partnerships/participation by the PI or research team in a network, consortium, multi-centre study</p> <p>Blondel is the UK lead for European Horizons project HiAOOS (High Arctic Ocean Observing Systems), designing and deploying acoustic sensors across challenging environments. Design and use considerations have cross-fertilised with the UKAN project, showing how it could be expanded to other settings.</p> <p>Young is a member of the Supergen ORE Hub Research Alignment Group, a committee set up to steer the UKRI-funded Supergen ORE Hub research direction.</p>		
Project Partners		
Value and details of in-kind co-investment: n/a	Value and details of cash co-investment: n/a	
<p>Summary: The UK has an extensive network of offshore renewable energy (ORE) infrastructure for wind and tidal power generation, and this is growing rapidly to meet the ambition of a net-zero future by 2050. Offshore wind power capacity was 11 GW in 2021 (approximately 10% of the UK's consumption). Tidal power capacity is currently <10 MW but will be expanding by over 400% to 41 MW in the next 5 years with three new or expanding sites in Scotland and Wales. Floating offshore wind has also had its first success in the recent Government Contract for Difference (CfD) auction (32 MW to be installed). These rapid expansions in ORE generation give significant opportunities and challenges for infrastructure design and use. In this project we have explored the potential of multi-purposing the UK's ORE infrastructure to support an extensive underwater acoustic monitoring and</p>		

surveillance network. Potential applications include monitoring of infrastructure integrity, defence and security of UK waters, biodiversity and population monitoring, underwater navigation and communication, and oceanographic and climate science.

Objectives: We did not provide objectives, but the tasks were:

WP 1.1 - Generate a comprehensive catalogue of ORE sites

WP 1.2 - Estimate the suitability of each site for acoustic-based monitoring

WP 2.1 - Analyse exemplar site(s) using numerical acoustic models

WP 2.2 - Engage relevant stakeholders to work towards a full-scale proposal.

Outcomes/Impact*:

WP 1.1: We have synthesised relevant information about Offshore Renewable Energy assets around the UK shore, both active, in development and planned

WP 1.2: We identified an exemplar site for analysis: Dogger Bank, selected because it is an offshore wind farm in a Marine Protected Area, and because of recent press coverage of Russian vessels visiting North Sea wind farms).

WP 2.1: We used benchmarked and validated acoustic propagation models (ACTUP suite) to quantify sounds from typical sources (e.g. ships, ORE devices, maintenance and installation activities) and how they are perceived by man-made sensors and different animals (marine mammals, fish).

We then translated this into sound mitigation ranges, to minimise impacts from the louder sources, and sound detection ranges, to detect acoustic sources of interest (e.g. ships, submarines, mammals).

This modelling was done over a wide range of frequencies (including the “shipping bands” recommended by the European Marine Strategy Framework Directive and its UK implementation) and for ranges up to 100 km from the exemplar site.

WP 2.2: In June 2023, we visited the European Marine Energy Centre to present our results and discuss further collaboration. We are working on an outline proposal for the UKRI cross-council scheme (deadline: 20th July).

***What activities have you undertaken to engage with research users, special interest groups and the general public to inform them about the research?**

We had to cancel a planned ORE-themed webinar of for UKAN+ due to the guest speaker from the ORE Catapult pulling out. We hope to reschedule this soon and to present our work as well as that of the ORE Catapult.

***Have any new research tools or methods been created or commissioned, if so, provide details:**

N/a

***What activities have you undertaken to engage with research users, special interest groups and the general public to inform them about the research?**

We visited the European Marine Energy Centre (EMEC, Orkney) to present our work and discuss a follow-on application. Funds for the trip were augmented by the Bath Beacon in Zero Carbon Offshore Renewable Energy.

***Have any new research datasets, databases and models making, or potential to make, significant difference to your research (or that of others), been created, if so, provide details:**

Simulation data will be made available on publication of the paper (See final box)

Conclusion: ORE infrastructure is placed in some locations (e.g. Marine Protected Areas) where acoustic monitoring could be of great interest – both for wildlife monitoring and for detection of unwanted activities (e.g. fishing or

surveillance). The propagation loss calculations for an example site suggest that a fishing vessel could be detected at a distance of over 1 km, thus the acoustic technique shows promise for this kind of monitoring.

Plans for follow-on activities/grants: How are these results being used to further the area of research or its application in an industrial setting?

We are working on an outline proposal for the UKRI Cross-Council scheme (deadline 20th July). The work will be on monitoring of ORE infrastructure for environmental and engineering purposes and the interface between consenting, monitoring and policy.

We hope to reschedule the ORE-themed UKAN+ webinar.

Weblink: (to the outcome of the project, the Open Access repository for the data¹, or press releases):

List of publications: in peer reviewed or non-peer reviewed literature. If no publications are available, what are the plans to publish? Please follow UKRI guidelines for Open Access <https://www.ukri.org/manage-your-award/publishing-your-research-findings/>

We have a paper in preparation for a special issue of Frontiers in Marine Science (Frontiers in Marine Sciences, Social Sciences and Engineering Research Related to Marine (Renewable) Energy Development), the working title is “Future Concepts in Multi-Purpose Offshore Renewable Energy Infrastructure” (submission deadline: 2nd August 2023)

¹ As a UKRI award holder you must follow their research data policies- <https://www.ukri.org/manage-your-award/publishing-your-research-findings/making-your-research-data-open>