Validating environmental monitoring systems for tidal turbines

Authors:
Benjamin Williamson, University of the Highlands and Islands
Anna Redden, Acadia University

Abstract ID: 98
Call:: MRC 2025 Technical Track – Call for Abstracts
What Theme Are You Submitting for?: Environmental and Ecosystem Considerations
Keywords: collision risk, environmental monitoring, floating, tidal turbine

Collision risk between marine animals (fish, diving seabirds, and marine mammals) and tidal turbine blades is often a significant barrier to consenting tidal stream energy projects. Data collection efforts are limited due to challenging operational environments, and a scarcity of validated sensors and automated detection and processing algorithms. Floating tidal turbines present unique environmental monitoring challenges compared to seabed turbines, due to increased flow speeds, surface air entrainment, and the dynamic nature of their platforms. However, floating turbines enable opportunities for accelerating industry data collection through lower-cost sensor installation, ease of access for maintenance and more straightforward data export and power connectivity, but only if technical and engineering issues can be resolved. As the industry transitions from single turbines to large-scale arrays, robust monitoring systems to observe animal behaviour around these devices becomes even more essential.

Here we present research from the operational O2 floating tidal stream turbine at the European Marine Energy Centre (EMEC) in the UK, trialling multibeam imaging sonar for automated target detection alongside video data to aid target identification when visibility permits.

Sensor performance across operating conditions is being characterised, alongside development of algorithms for automated data processing utilising data collection from in situ field testing. The aim is to optimise the system for detecting and documenting marine animal interactions within the rotor-swept area.

The outcomes can be used to inform consent and operation of tidal stream turbines, including future deployments of the O2-X turbine targeting the Bay of Fundy through demonstrating the transferability of results and techniques, and are feeding into wider sensor trials being planned in Nova Scotia, Canada.