



How could tidal stream arrays in the Pentland Firth, Scotland, interact with each other?

Rory O'Hara Murray

Marine Scotland Science, Scottish Government, Aberdeen, United Kingdom (r.murray@marlab.ac.uk)

Around half of Scotland's marine renewable tidal stream resource is located in the Pentland Firth and Orkney Waters (PFOW), with most of it in the Pentland Firth. There are currently four tidal arrays planned in the Pentland Firth, each at various stages in the licensing process. All the tidal arrays utilize kinetic energy in the same tidal wave and therefore have the potential to affect the resource in the whole region, as each tidal farm will to some extent extract and redirect energy within the Pentland Firth. This work investigates the effect that extracting tidal stream energy in the Pentland Firth may have on tidal processes (tidal amplitudes, speeds, phases and transport) in this region, and how four arrays of tidal stream turbines could interact with one another.

Whilst an area of the seabed has been leased to the developers, the final array layouts are unknown. For this reason, this work uses hypothetical array layouts. A three dimensional unstructured grid hydrodynamic model with a high horizontal resolution around the Orkney Islands was used, and the tidal stream turbines were represented as sub grid scale objects using a momentum sink. How the resource in the region changes due to each development is investigated, along with the combined effects of all four tidal stream arrays.

This work shows that some of the currently planned tidal arrays are likely to weakly effect the resource of some of the other planned arrays. This interaction is limited to arrays that are aligned in the tidal stream and in relative close proximity to each other. More distant arrays do not show the same interaction. Whilst these interactions are minimal at this currently planned scale, they could have implications on the planning of additional and/or larger scale arrays in this region.