

Marine2021 Proposed Session: Tidal energy resource assessment and optimisation

Dr Athanasios Angeloudis ^{1,*}, Prof Vengatesan Venugopal²

¹*Institute for Infrastructure & the Environment, School of Engineering, The University of Edinburgh, Edinburgh, UK.*

²*Institute for Energy Systems, School of Engineering, The University of Edinburgh, Edinburgh, UK.*

* a.angeloudis@ed.ac.uk

The propagation of tides in nearshore and coastal regions often leads to predictable energy-dense current velocities and sea level elevation variations. The occurrence of amplified streams (high velocity currents) or ranges (large elevation differences) is a result of the interaction of localised coastal morphology, bathymetry and ocean hydrodynamics driven by tidal waves. There are considerable efforts undertaken to exploit this resource for electricity production using sustainable marine energy technologies in the UK, Europe and around the globe. As an example, the first array of tidal stream turbines has been deployed in the Pentland Firth, Scotland, UK. More tidal stream array concepts are under development/consideration at a global scale. Interest in tidal range structures has also resurfaced following the construction of the Lake Sihwa tidal power station in South Korea, with other sites identified for their potential. Accordingly, significant progress has been made on the development of numerical tools that aide the design of these projects. However, given the harsh and dynamic nature of the hydrodynamics, models need to account for many uncertainties, stemming from physical, and technical unknowns that are challenging to capture across multiple scales. There is an urgent need to develop reliable computational simulation and optimisation tools to improve the resource characterisation to assist with tidal energy converters design. This session will discuss computational methods applied to address these challenges, focusing on recent developments and applications.

Indicative areas of talks:

- Tidal stream resource assessment
- Tidal range energy resource and impact assessments
- Numerical optimisation approaches in tidal energy feasibility studies
- Multi-scale hydrodynamic modelling for marine energy

Invited Speakers - confirmed

1. Prof Matthew D. Piggott, Professor of Computational Geoscience and Engineering,
Imperial College London
2. Prof Simon Neill, Professor in Physical Oceanography,
Bangor University