

## Making the most of tidal energy

The experimental studies carried out and software tools developed during this project have provided a base of information for the future design of tidal energy turbine arrays.

### The need

The seas around our coast offer the richest source of marine energy in Europe, with considerable potential to help the Government meet its commitment to provide 15% of the UK's energy needs from renewable sources by 2020. The energy present in tidal streams can be converted into electricity using turbines similar to those used in wind farms. However, tidal stream energy will only become financially viable when devices are installed in large numbers. Understanding the interaction between turbines and their impact on flow will be crucial in maximising energy capture.

### The results

During this project, a series of experiments were carried out, including:

- Conducting fundamental research into flow effects.
- Using small-scale, porous, disc simulators to investigate parameters such as proximity to seabed/surface, flow velocity and distance between turbines.
- Undertaking complex experiments, which were performed at a large, international, water-channel testing facility in France. These tests focused on the wake that forms just downstream of a turbine.

Full 3D flow maps were produced during the experiments to better understand the flow in and around a tidal turbine wake. Being able to predict the wake shape and intensity at distances downstream of a turbine is an important factor when optimising the layout of a tidal turbine array (or farm).

The results from the project are being used to develop mathematical models for tidal turbines that are currently being used in the wind industry. Furthermore, depending on the water depth, the project highlighted the possibility of increasing energy capture in an array by optimising the distance between turbines.

## What are tidal streams?

Tidal streams (or marine currents) are fast sea currents created by the tides. They are often magnified by features such as headlands, inlets and straits or by the shape of the seabed when water is forced through narrow channels.

## Project benefits

Potential tidal energy sites are concentrated in geographically small areas, so it is crucial to optimise the design and placement of farms to avoid the risk of under utilising the significant resource available. High-quality data, such as those produced during this project, are a pre-requisite for the development of computer models for use in array design.

The project has provided a greater understanding of the physical processes involved in energy extraction from tidal streams. With this knowledge, developers and investors will be able to obtain reliable long-term estimates of energy capture when making the business case for tidal stream projects.

Scale model of a tidal turbine

## Market potential

The tidal energy industry is still at an early stage, but the UK is in a unique position to benefit from this type of renewable energy and to develop related services. The Carbon Trust estimates that between 15% and 20% of the current UK's electricity demand could be met by wave and tidal stream energy with the potential to install 2 GW of generation capacity by 2020 and up to 30 GW by 2050.

### Technology Strategy Board Driving Innovation

Collaborative research and development projects are one of the tools that the Technology Strategy Board uses to drive innovation in the UK. The Technology Strategy Board is a business-led executive non-departmental public

body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve the quality of life. It is sponsored by the Department for Business, Innovation and Skills (BIS).

Tel: 01793 442700 [www.innovateuk.org](http://www.innovateuk.org)

### HOW THE TECHNOLOGY STRATEGY BOARD MADE A DIFFERENCE:

'The understanding gained and the tools developed will be vital to the successful commercial development of tidal energy.'



The water-channel testing facility in France

**Project #** 200018

#### Project partners

Garrad Hassan and Partners Limited  
University of Southampton, School of Civil Engineering and the Environment

#### Technology Strategy Board investment

£297,380

#### Total project investment

£462,500

#### Project contact details

Robert Rawlinson-Smith  
Garrad Hassan and Partners Limited  
St Vincent's Works  
Silverthorne Lane  
Bristol BS2 0QD

E [marine@garradhassan.com](mailto:marine@garradhassan.com)

T 0117 972 9900

W [www.garradhassan.com](http://www.garradhassan.com)

A.S.Bahaj  
University of Southampton

E [serg@soton.ac.uk](mailto:serg@soton.ac.uk)

[www.energy.soton.ac.uk](http://www.energy.soton.ac.uk)