

Tidal stream energy

The work of the University grows increasingly important as efforts to harness tidal power continue apace. On our own doorstep, the Humber estuary's depth and tidal flow make it one of the best locations in the UK for tidal power.

Tank testing at the University's Total Environmental Simulator (TES) research facility, housed at The Deep, and our world-leading expertise in wave power, tidal stream, wind turbulence, data analysis and mathematical modelling is playing a crucial role in the design and development of highly efficient, commercially viable turbines.

The TES also allows us to consider turbine seabed interactions. Designed for scaled physical modelling of sediment transport dynamics and flow hydraulics, the TES enables detailed measurement of the processes operating at the sediment-fluid interface under a range of complex environmental conditions.

The University's Institute of Estuarine and Coastal Studies (IECS) researches and consults on some of the world's major marine and coastal projects. Activity includes monitoring the environmental impact of tidal stream power developments, and the interaction between coastal developments, human activities and plant and animal life, as well as providing input on policy, governance and management. Given the location requirements of the emerging industry, such issues are integral to the development of tidal stream energy.

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Dr Richard Barnes, Law School



Notably, IECS attracts more than £1m a year of research funding from industries, government bodies such as the Department of the Environment, Food and Rural Affairs (Defra) and the EU, in addition to its consultancy income. It is the lead UK partner for a pan-European project on tidal river development. Coordinated by the Port of Hamburg Authority, the project aims to look at the integrated management of European estuaries in the light of port developments.

In maritime law, the University covers the conflicting uses of spaces and regulatory controls that protect the environment. Proposed developments are subject to scrutiny and potential risks are investigated using the predictive capacity of science.

The region's tidal energy companies are also able to draw on the expertise of the Department of Politics and International Studies, which has unsurpassed knowledge on EU climate change policy and has just completed a major international study, The European Union as a Leader in International Climate Change Politics.

Our work in this exciting area of industry will help the region's economy boom and build a reputation based on it being at the forefront of UK tidal power.



Case Study

Scientific expertise from the University's Marine Renewables Research Group has resulted in the design and development of devices that will harness the force of nature to generate greener forms of energy.

A number of high-profile businesses have commissioned Jack Hardisty, Professor of Environmental Physics, to carry out numerical modelling and tank testing at the Total Environmental Simulator research facility, housed at The Deep.

Prof Hardisty has world-leading expertise in the analysis of wave power, tidal stream and wind power systems, and carries out essential data analysis prior to full-scale prototypes being built.

Neptune Renewable Energy Ltd and Pulse Tidal are two leading companies that have utilised his expertise.

Neptune's full-scale Proteus Tidal Stream Power Device demonstrator has since passed in-water testing, paving the way for arrays of the generators in the Humber. The company's engineers believe the Proteus will generate at least 1,000 megawatts of energy a year – enough to power 500 homes.

For Pulse Tidal, the University built a mathematical model of a device that converts shallow wave tidal power into energy. Subsequently, a prototype rig was lowered into the Humber and now powers an Immingham chemical company.

The University's analytical capabilities have played a crucial role in the development of highly efficient designs. Prof Hardisty, who included some of the data in his book *The Analysis of Tidal Stream Power*, said: 'The manufacturing costs have been minimised for these companies so that tidal electricity can now be generated at competitive commercial prices for the first time.'