



DHI MARKET AREA: ENERGY

## WAVE AND TIDAL ENERGY

Harnessing the power of the sea

Wave and tidal technologies are among the most promising green technologies as they tap into the most concentrated source of renewable energy. According to one estimate, using 1% of the world's wave energy resources would cover the world's current total energy needs four times over. Wave and tidal technologies are still in the pioneering phase, but they are expected to grow rapidly in the coming decade. Many challenges must be overcome in order for the industry to sustain this growth and for these technologies to reach maturity. These challenges include sustainably dealing with the dynamic and delicately balanced marine environment as well as managing previously untapped resources and emerging technologies.

Developers are continuously trying to reduce their project risks. To do this, it's necessary to have a good understanding of the physical and natural environment to ensure sound structural engineering, optimal placement to maximise energy yield, smooth consenting procedures, and cost competitiveness.

- THE CHALLENGES**
- Managing the uncertainties of previously untapped resources and emerging technologies
  - Coping with harsh environmental conditions
  - Ensuring the sustainability of structures
  - Minimising environmental impact
  - Maximising energy yield to ensure economic feasibility

**OUR APPROACH** Understanding and reducing uncertainties is the key to wave and tidal energy development success. We can help you achieve this by tapping into our in-depth knowledge of water environments as well as our decades of experience planning, designing, developing and managing marine structures. All of our solutions are based on a thorough understanding of the environment, energy flows and Metocean conditions at each project site. Our numerical and physical modelling provides an accurate description of the environment and forms the basis for further analyses and assessments.

**OUR SOLUTIONS** Our innovative solutions are based on a combination of field data collection, on-line monitoring, numerical modelling and physical model tests. By accurately assessing resources as well as forecasting energy flows and Metocean conditions, we can help you select the optimal site for your wave or tidal energy development. We have the tools needed to support your development of cost-effective and secure structures able to withstand the harshest conditions over their projected lifetime. By using our environment and ecological services, you will ensure that the impact of your development on the ambient environment and ecosystems is limited.

**THE ULTIMATE GOAL** MARKETABLE WAVE AND TIDAL ENERGY

In the next decade the wave energy market is expected to grow exponentially, from 100 MW in 2010 **up to 2.5 GW in 2020**

Carbon Trust

## OUR TOOLS AND SERVICES

Success in the wave and tidal energy market will depend on reducing the risks involved in the development process. Reliable resource estimates and forecasts as well as sustainable, yet cost-efficient devices and structures are vital. We can help with:

- numerical modelling using MIKE Powered by DHI software suite, which includes:
  - wave and currents
  - water-structure interactions and scour
  - morphology and sediment transport
  - ecology and biodiversity, including habitat modelling
- physical model testing (in-house facilities)
- Computational Fluid Dynamics (CFD) analysis for detailed flow analysis
- Metocean data – hindcast, nowcast and forecast for engineering, planning, construction and operation
- on-site water and energy forecasts
- survey and monitoring services including hydrographic, environmental and ecological surveys
- Local Area Weather Radar (LAWR)
- Geographic Information System (GIS) services for easy visualisation of constraints and results
- Site Energy Assessments (SEAs) and feasibility studies
- critical design conditions for the structure and devices
- Environmental Impact Assessments (EIAs)
- support during the consenting process and for environmental permit applications
- Decision Support Systems (DSS) to support you in making informed decisions
- capacity building and training by THE ACADEMY by DHI

## OUR EXPERIENCE

We have a long history of working with wave and tidal energy developers in order to facilitate the successful implementation of technology in this emerging industry. After initially testing wave devices in our tanks, developers have conducted detailed resource assessments – including optimising array configurations.

We provided expert input on coastal processes for the EIA of the first commercial tidal projects successfully granted consent in Scotland. In addition, we're currently providing a thoroughly calibrated and validated model of the Pentland Firth and Orkney Island area to tidal and wave developers (under the patronage of The Crown Estate). This model will be utilised by the developers, among others, to conduct detailed resource assessments.

We've been exploring suitable sites for the development of marine energies in Europe, India, South-East Asia and Australia. Furthermore, we've conducted projects in the marine environment in more than 100 countries around the world. We draw on our extensive knowledge of marine structures and cabling to facilitate the transfer of knowledge from different marine-related industries to the wave and tidal energy industry.

In the field of habitat modelling in particular, we have extensive experience conducting marine mammal and bird studies. This has been proven to be highly effective in reducing monitoring requirements in the offshore wind industry while increasing the statistical power of the data set – helping companies avoid lengthy and costly monitoring schemes.

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