

# Marine Energy

Scotland has some of the best and most exploitable marine renewable energy resources in the world. The Atlantic Ocean delivers abundant wave energy to the western shores and the regular tidal flows between the Atlantic and North Sea create a very high tidal current energy resource. Wave and tidal energy will be important contributors to a diverse and secure future energy mix because they are predictable and increasingly able to be forecast.



Scotland's heritage, human capacity and facilities in naval architecture, marine and offshore engineering uniquely position it to become the birthplace and breeding ground for a new industry built around manufacture of marine energy technology, growing its supply chain and installation infrastructure and developing its education and training base.



There are currently full-scale prototype wave and tidal energy generators at sea, connected and delivering energy to the UK network and other prototypes are nearing installation. 2010 began the decade of increasing deployment of marine energy technology, with ambitious targets set to see up to 2000 MW of wave and tidal current generators installed in UK waters by 2020 and one of the greatest challenges facing the industry is how to reduce the cost of the delivered energy.

## Consortia and Projects

The multidisciplinary and interconnected nature of the academic and industrial marine energy sector has led to collaborative projects becoming commonplace. An example of some of the collaborative projects undertaken by ETP university partners in marine energy are:



- SuperGen UK Centre for Marine Energy Research (UKCMER)
- The Marine Alliance for Science and Technology for Scotland (MASTS)
- The MARINET consortium provides facility access to EU technology and project developers.
- The Industrial Doctoral Centre for Offshore Renewable Energy (IDCORE) will train 50 EngD students over a 5 year period. This joint programme is operated by the universities of Edinburgh, Strathclyde and Exeter along with SAMS and HR Wallingford.

# Marine Energy

## Summary of Marine Energy Expertise in the ETP

### Resource Assessment

One of the key areas of expertise in ETP is in assessment of renewable energy resources including wave and tidal alongside others like wind and hydropower. Such analysis is vitally important for project feasibility studies, planning policy, wider energy network analysis as well as specification of marine energy devices.

### Resource Modelling

Modelling plays a major part in the resource assessment process, whether this be at geographical level or more detailed individual sites. ETP institutions are well placed to conduct numerical and statistical evaluations of both wave and tidal energy sites.

### Tank Testing

The University of Edinburgh has built a reputation for tank testing over 40 years. The latest tank (the All-Waters Combined Current and Wave Test Facility) is capable of simulating both currents and waves. Its scale and capability makes this an unparalleled world class facility. The University of Strathclyde offers the Kelvin Hydrodynamics Laboratory for large scale tests.

### CFD modeling

Throughout the ETP university partners, computational fluid dynamics remains an invaluable tool to understand the fluid-structure interactions of marine energy devices and the water. The Universities of Strathclyde and Edinburgh use a combination of bespoke and commercial software packages to conduct computationally intensive modeling. Edinburgh can also provide access to supercomputer HECTOR.

### Economic modelling and assessment

The economics of projects have been examined by a number of projects and institutes within ETP. The Fraser of Allander Institute at the University of Strathclyde carries out research on the regional and Scottish economy with a particular interest in energy issues.

### Machine design

At Edinburgh's Institute for Energy Systems much research activity relates to the ability to extract power from the sea. In particular this includes novel direct drive linear and rotary electrical generators and considerable work into the effective and efficient control of marine energy devices.

### Environmental Impact modelling

Both the University of the Highlands and Islands (SAMS and ERI at Thurso) and Heriot Watt's ICIT campus are active in modeling the Environmental impact of marine energy of the flora and fauna found in the sea.

## The Scottish Energy Laboratory (SEL)

Energy sector test facilities have been brought together under the Scottish Energy Laboratory (SEL) umbrella. Facilities of particular relevance to the marine sector include:

- University of Aberdeen OceanLab sea testing facility
- University of Edinburgh curved wave tank and wave flumes
- University of Edinburgh machine and power electronics test laboratory
- FloWave TT (University of Edinburgh) All Waters Combined Current and Wave Test Facility.
- Heriot Watt University wave basin
- University of Strathclyde Kelvin Hydrodynamics Laboratory
- Energy Technology Centre - component test facilities
- European Marine Energy Centre. World leading, grid connected test facility in the waters around Orkney

For more details visit: [www.scottishenergylaboratory.com](http://www.scottishenergylaboratory.com)