When it comes to renewable energies, wind and solar power have already become staples of our electricity mix. Wave and tidal energy could be next in line. EU-funded researchers are already making waves, aiming to help industry cut costs and increase reliability with innovative decision-making software.

Globally installed wave and tidal power arrays will reach a capacity of more than 330 gigawatts (GW) by 2050, according to an International Energy Agency (IEA) forecast. By comparison, the capacity of the much more developed wind energy sector reached the same figure – 336 GW – by the end of June 2014. To give this figure some meaning: together, the world’s wind turbines can generate around 4% of current global electricity demand according to the World Wind Energy Association.

Compared to wind energy – and indeed solar power – wave and tidal energy has one big advantage: while it is variable, the energy flows are highly predictable, since tides in particular are very regular.

**Catching the wave**

While this form of renewable energy is still new, recent developments are however giving a boost to wave and tidal energy technology. The DTOcean [2] project is working to accelerate industrial development still further.

“Wave and tidal power is still at a nascent stage at present, but we are quickly moving from the development into the deployment phase,” explains Henry Jeffrey, senior lecturer at the University of Edinburgh’s School of Engineering and principal investigator for the DTOcean project.

“The industry is developing technology and starting to build small farms of up to 10 devices,” he adds. “Even so, that is only just a very small contribution to Europe's and the world’s energy portfolio right now.”

To speed up the process, DTOcean is creating a decision-making and planning tool for the
development of large-scale wave and tidal power farms of the future. While a farm with one or two wave energy converters – the machines that exploit the wave energy and convert it into electricity – does not require such planning, an array of tens of such devices, for instance, certainly does.

Finding the right mix

With the help of this tool, the array’s operator will be able to calculate the best layout and balance of options for both cost and reliability, as well as how to keep the impact on the environment minimal.

What kind of inter-array subsea cable should be used to connect the converter arrays to the power grid onshore? What type of moorings and foundations and which model of installation vessel are best? Besides answering those questions, the computer-based tool will also make recommendations on the best possible operation and maintenance strategy for the planned installation.

Finding the right combination of all of these elements – cables, moorings and foundations, installation, operation and maintenance – is no trivial matter, and simply not possible manually, due to the wide range of factors that affect the overall cost of energy. For instance, an operator might choose a certain type of installation vessel, cable type and layout for 20 devices, but a different set of options might be more cost-effective and reliable for 50 devices.

Catering to the industry

During the first year of the project, the partners built the algorithms underpinning the tool and are in the early stages of constructing the initial version, which will then be presented to potential users. The project partners will then further refine and test the system until the project ends in October 2016.

The industry has shown great interest in DTOcean's work from the start: many global players are contributing either as project partners or through an industry advisory board to ensure that the end-product corresponds to their requirements.

“Our project gives the opportunity to provide long-term planning for the sector,” explains Jeffrey, stressing that this work could not be done by one individual company. “Rather than waiting until it will be needed in a few years' time, we are paving the way for the future of wave and tidal energy now.”

See also: CORDIS [3]

Project: Optimal Design Tools for Ocean Energy Arrays
Project Acronym: DTOCEAN
Contact: Contact [4]


Links [1]
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