Marine energy doubled by predicting wave power

The energy generated from our oceans could be doubled using new methods for predicting wave power. Research led by the University of Exeter, published (27 June) in the journal *Renewable Energy* , could pave the way for significant advancements in marine renewable energy, making it a more viable source of power.

The study was carried out by a team of mathematicians and engineers from the University of Exeter and Tel Aviv University. They devised a means of accurately predicting the power of the next wave in order to make the technology far more efficient, extracting twice as much energy as is currently possible.

Marine energy is believed to have the potential to provide the UK with electricity twice over. However, technologies to extract and convert energy from the sea are relatively immature, compared with solar or wind, and are not yet commercially competitive without subsidy. Very substantial progress has been made by the leading device developers, but key challenges remain: preventing devices being damaged by the hostile marine environment; and improving the efficiency of energy capture from the waves. This research addresses both problems by enabling control over the devices that extract wave energy. The key to this is to enable devices to accurately predict the power of the next wave and respond by extracting the maximum energy.

The research focused on point absorbers, commonly-used floating devices with parts that move in response to waves, generating energy which they feed back to the grid. Point absorbers are already known to be much more efficient in the amount of energy they produce if their response closely matches the force of the waves and previous research has looked at trying to increase this efficiency. However, this is the first study that has focused on increasing the device's efficiency by predicting and controlling internal forces of the device caused by forthcoming waves.

The team devised a system, which enables the device to extract the maximum amount of energy by predicting the incoming wave. This information enables a programme to actively control the response required for a wave of a particular size. Because the device responds appropriately to the force of the next wave, it is far less likely to be damaged and would not need to be turned off in stormy conditions, as is currently the case.

Lead author Dr Guang Li of the University of Exeter said: "Our research has the potential to make huge advances to the progress of marine renewable energy. There are significant benefits to wave energy but progressing this technology has proved challenging. This is a major step forward and could help pave the way for wave energy to play a significant role in providing our power."

Co-author Dr Markus Mueller of the Environment and Sustainability Institute at the University of Exeter's Cornwall Campus said: "The next step is for us to see how effective this approach could be at a large scale, by testing it in farms of Wave Energy Converters."

The University of Exeter is collaborating with Ocean Power Technologies, a leading wave energy device developer, to exploit and further develop the results from this research. This further activity is supported by the European Union Seventh Framework Programme (FP7/2007-2013) in a project called 'WavePort'.

Provided by University of Exeter

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http://phys.org/news/2012-06-marine-energy-power.html