Wave device could deliver clean energy to thousands of homes

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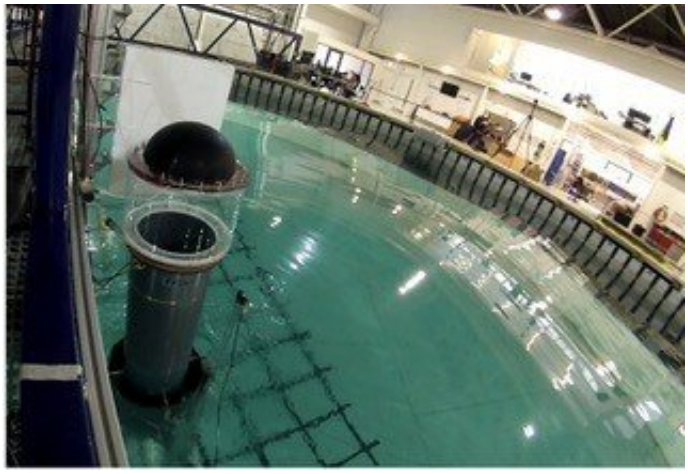


Scale trials are held in the FloWave facility at the University of Edinburgh of a wave energy converter device that could provide power to thousands of homes. Credit: Universities of Trento, Bologna and Edinburgh and Scuola Superiore Sant'Anna Pisa

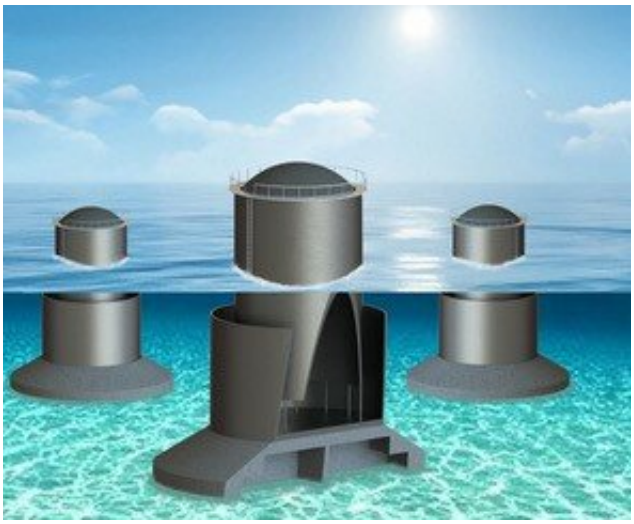
A wave energy technology is being developed that could help generate low-cost electricity for thousands of houses.

The device costs less than conventional designs, has fewer moving parts, and is made of durable materials. It is designed to be incorporated into existing ocean energy systems and can convert wave power into electricity.

Small scale experiments in an ocean simulator show that one full-size device could generate the equivalent of 500kW, enough electricity for about 100 homes. Engineers say that their design could be used in fleets of low-cost, easily maintained structures at sea within decades, to take advantage of powerful waves in Scottish waters.

Engineers from the University of Edinburgh and from Italy developed their device—known as a Dielectric Elastomer Generator (DEG) - using flexible rubber membranes. It is designed to fit on top of a vertical tube which, when placed in the sea, partially fills with water that rises and falls with wave motion.

As waves pass the tube, the water inside pushes trapped air above to inflate and deflate the generator on top of the device. As the membrane inflates, a voltage is generated. This increases as the membrane deflates, and electricity is produced. In a commercial device, this electricity would be transported to shore via underwater cables.



Schematic image of a wave energy converter device being developed by researchers at the Universities of Trento, Bologna and Edinburgh and Scuola Superiore Sant'Anna Pisa. Credit: Universities of Trento, Bologna and Edinburgh

A scaled-down version of the system was tested in the FloWave facility at the University of Edinburgh, a 25m diameter circular tank that can reproduce any combination of ocean waves and currents.

The system could replace conventional designs, involving complex air turbines and expensive moving parts.

The study, published in *Proceedings of the Royal Society A*, was carried out in collaboration with the Universities of Trento, Bologna and Scuola Superiore Sant'Anna Pisa in Italy. It was supported by the European Union Horizon 2020 programme and Wave Energy Scotland.

Professor David Ingram, of the University of Edinburgh's School of Engineering, who took part in the study, said: "Wave energy is a potentially valuable resource around Scotland's coastline, and developing systems that harness this could play a valuable role in producing clean energy for future generations."

More information: Modelling and testing of a wave energy converter based on dielectric elastomer generators, *Proceedings of the Royal Society A*, rspa.royalsocietypublishing.or … .1098/rspa.2018.0566

Provided by University of Edinburgh