Rubber 'snake' could help wave power get a bite of the energy market

July 3 2008

The Anaconda device could be used in groups of 20 or more.

A device consisting of a giant rubber tube may hold the key to producing affordable electricity from the energy in sea waves.

Invented in the UK, the 'Anaconda' is a totally innovative wave energy concept. Its ultra-simple design means it would be cheap to manufacture and maintain, enabling it to produce clean electricity at lower cost than other types of wave energy converter. Cost has been a key barrier to deployment of such converters to date.

Named after the snake of the same name because of its long thin shape, the Anaconda is closed at both ends and filled completely with water. It is designed to be anchored just below the sea's surface, with one end facing the oncoming waves.

A wave hitting the end squeezes it and causes a 'bulge wave'* to form inside the tube. As the bulge wave runs through the tube, the initial sea wave that caused it runs along the outside of the tube at the same speed, squeezing the tube more and more and causing the bulge wave to get bigger and bigger. The bulge wave then turns a turbine fitted at the far end of the device and the power produced is fed to shore via a cable.

Because it is made of rubber, the Anaconda is much lighter than other wave energy devices (which are primarily made of metal) and dispenses with the need for hydraulic rams, hinges and articulated joints. This reduces capital and maintenance costs and scope for breakdowns.

The Anaconda is, however, still at an early stage of development. The concept has only been proven at very small laboratory-scale, so important questions about its potential performance still need to be answered. Funded by the Engineering and Physical Sciences Research Council (EPSRC), and in collaboration with the Anaconda's inventors and with its developer (Checkmate SeaEnergy), engineers at the University of Southampton are now embarking on a programme of larger-scale laboratory experiments and novel mathematical studies designed to do just that.

Using tubes with diameters of 0.25 and 0.5 metres, the experiments will assess the Anaconda's behaviour in regular, irregular and extreme waves. Parameters measured will include internal pressures, changes in tube shape and the forces that mooring cables would be subjected to. As well as providing insights into the device's hydrodynamic behaviour, the data will form the basis of a mathematical model that can estimate exactly how much power a full-scale Anaconda would produce.

When built, each full-scale Anaconda device would be 200 metres long and 7 metres in diameter, and deployed in water depths of between 40 and 100 metres. Initial assessments indicate that the Anaconda would be rated at a power output of 1MW (roughly the electricity consumption of 2000 houses) and might be able to generate power at a cost of 6p per kWh or less. Although around twice as much as the cost of electricity generated from traditional coal-fired power stations, this compares very favourably with generation costs for other leading wave energy concepts.

"The Anaconda could make a valuable contribution to environmental protection by encouraging the use of wave power," says Professor John Chaplin, who is leading the EPSRC-funded project. "A one-third scale model of the Anaconda could be built next year for sea testing and we could see the first full-size device deployed off the UK coast in around five years' time."

Source: Engineering and Physical Sciences Research Council

Citation: Rubber 'snake' could help wave power get a bite of the energy market (2008, July 3) retrieved 23 April 2024 from https://phys.org/news/2008-07-rubber-snake-power-energy.html