Electricity from waves

Power buoys

How the sea stands a good chance against sun and wind

WAVE power has so far promised a lot more than it has delivered. As early as 1982, Britain—which has one of the most abundant supplies of wave energy in the world—officially abandoned it, thinking it would never deliver electricity at a competitive price. When private enterprise moved in, Osprey, the first commercial wave-energy machine, was wrecked off the coast of Scotland by a storm in 1997.

According to America's Office of Naval Research, though, wave power is not dead in the water. A device developed for naval applications may have commercial potential. Working for the navy, a small, New Jersey-based company called Ocean Power Technologies (OPT) has made a buoy that turns wave energy into electricity at the rate of 1kW—enough power to run a single-bar electric heater. The buoy collects the energy using a piston that rides up and down with the motion of the waves. This turns a generator, and the electricity produced is stored in a battery.

The navy is interested in power buoys as a possible way of supplying energy to the unmanned underwater vehicles that it uses for reconnaissance, surveying the seabed, and tracking enemy submarines. These vehicles could dock with the power buoys and replenish their batteries without any need for human intervention.

During the course of its research, however, OPT realised that it could make bigger and more powerful buoys that might be able to generate electricity commercially. It has now developed a 20kW version. Four such machines will be installed off the coast of Victoria in Australia over the next 18 months, in an experiment that connects them to the local electricity grid. A 100kW buoy is also being designed, and within two or three years OPT hopes to link large numbers of these together to build offshore power stations with outputs of between 10MW and 100MW.

Previous attempts to harness wave power have involved large and complex structures. Buoys, by comparison, are simple and, according to OPT's president, George Taylor, should last for many decades in the open sea.

Dr Taylor also believes that his buoys will be profitable without subsidy, unlike many other attempts to produce electricity from "renewable" sources. The cost of his buoys' electricity is currently around seven cents a kW-hour, but he expects this to fall to about three cents a kW-hour in commercial production, which would be competitive with conventional generators. The plant itself is relatively expensive. A 1MW power station, including buoys, anchors, power cables and onshore conversion devices, would cost $5m. That is significantly more than the cost per MW of a conventional generator. But the fuel is free, and the running costs amount largely to scraping barnacles off the buoy's bottom every so often.

Wave power generated this way could have many advantages. There would be none of the noise and visual impact of wind farms, since it would be based several kilometres offshore, and, since waves are a concentrated source of energy, "wave farms" need not be large. The buoys may also reduce shore erosion, by taking energy out of waves before they reach land. And strong enough waves are available for 90% of the time. Solar- and wind-powered generators, by contrast, work for only 20-30% of the time. This, says Dr Taylor, is why wave power is suitable for large-scale power generation, and why wave economics will beat solar and wind. ■

I've got the power