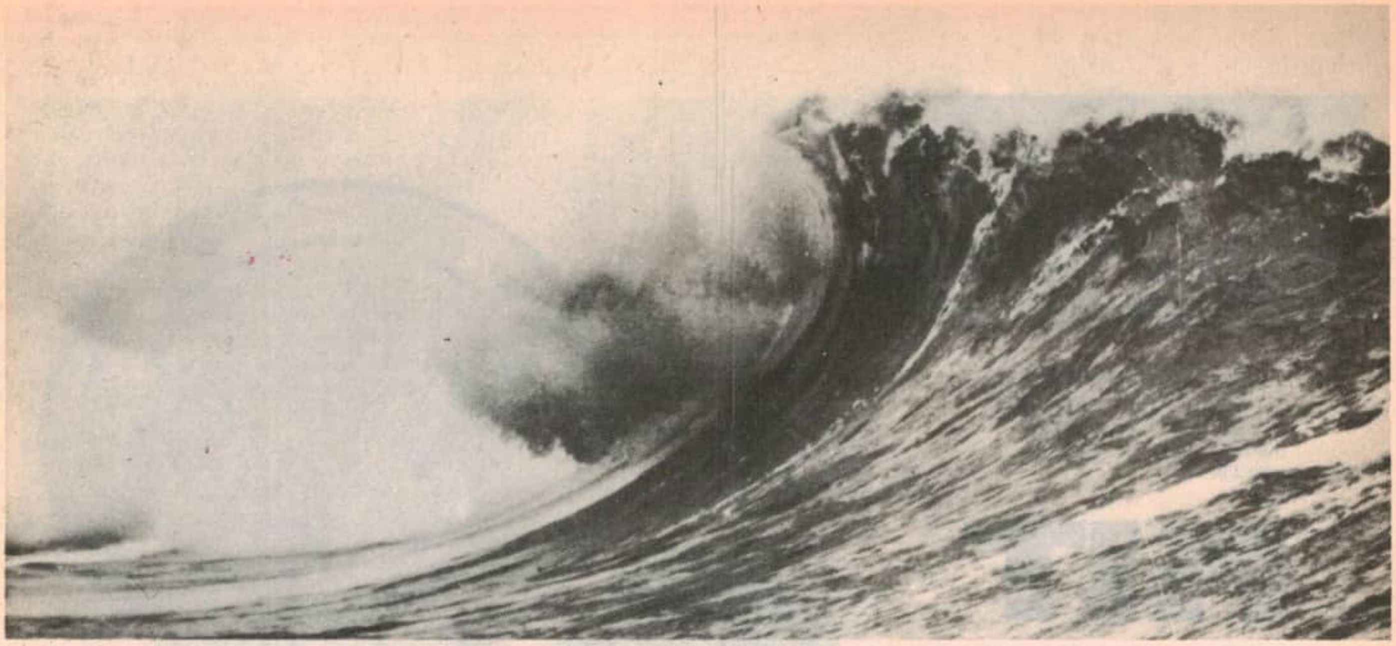


Wave power: energy for Britain's future

Faced with a dwindling supply of fossil fuels, the world's industrialised nations are now exploring alternative energy concepts. At the forefront of the various alternatives are the so-called natural energy resources which are, as yet, virtually untapped. In Britain, the concept of generating electricity from sea waves is receiving serious attention, as this article reports.

by MICHAEL KENWOOD

Technology Editor, "New Scientist", London.

Natural energy systems are very much in vogue these days, as it is now generally accepted that oil and gas reserves will begin to run out in the foreseeable future. There are alternatives available, including nuclear power and coal, but wouldn't it be much better if we could develop energy systems that do not depend upon energy reserves?

Wave power is one system that fits into this category, along with solar power and wind power. These energy supplies will be continuously renewed for as long as the sun shines.

Britain has shown more interest in wave power than in other "natural" energy systems and for a very good reason—she has a long coastline that is continuously battered by waves. Among the advantages of wave power are the enormous amount of energy freely available, and the fact that power output would be at a peak during winter when the weather is roughest. This is the reverse of the oft-mooted solar power schemes, which are not considered feasible for northern latitudes.

The earliest indication that there was any official support for wave energy in Britain came in a report prepared in 1974 by the Central Policy Review Staff—the government's "think tank"—which said that wave power "has some favourable features in the United Kingdom context. The usable coastline amounts to some 900 miles (1500km) and the energy theoretically available from its exploitation on a reasonable economic basis would sustain a capacity of up to 30,000MW." This is about half the country's installed generation capacity.

The British Government has given support to the idea. To begin with, it commissioned a study of the subject from the National Engineering Laboratory (NEL). The NEL report has since been submitted to the government, although it has not yet been published.

The second government move was to set aside £110,000 for research on wave power. This money was awarded to Dr. Stephen Salter of Edinburgh University's Department of Mechanical Engineering to continue investigations into a system he has devised for converting sea waves into electricity.

In another project, a team of engineers is working on a different approach. This team, Wavepower Ltd, has as one of its leading lights Sir Christopher Cockerell, who invented the hovercraft.

When Salter first looked into wave power he came to the conclusion that the old idea of designing something that would extract energy from the waves by bobbing up and down was not the best one. Waves may look impressive as they rise and fall but most of the energy is in the to and fro motion of the water. Salter's first move was to design a vane that could rotate with the motion of the waves.

Basically simple in concept, Salter's method would involve the stationing, at suitable offshore locations, of large concrete breakwaters fitted with these moveable vanes. Calculations have shown that a structure the size of a supertanker, submerged to a depth of 10 to 20 metres and with vanes protruding a metre above the surface, could generate 5 megawatts of electricity throughout the year.

Wavepower suggests that its system might produce useful energy in a similar way, but the engineers working on this project believe their technique would require less development and could be brought into operation more quickly.

Wavepower's concept is extremely simple. The energy collector would be a string of floats hinged together in a line. The floats would take energy from the waves as they travelled along the line of floats. There would be hinges between adjacent floats, and pumps on these hinges would absorb power from the relative motion of the floats.

Malcolm Woolley and Jim Platts, two engineers working with Wavepower, say that their aim is "to develop a wave-power device that, within the bounds of current technology, is simple, cheap, made up of relatively small mass produced units, can be installed in sections and can be easily maintained a section at a time."

Wavepower has carried out some small model tests in tanks at the British Hovercraft Corporation. These showed that the hinged float system could be as efficient at taking energy from waves as Salter's rotating vane. However, efficiency is less important than the cost of the equipment when you don't have to pay for the fuel.

An important factor in the Wavepower system is the length of the floats. These have to be short enough to rotate in relation to one another as the waves travel along the line of floats. If they are too long then waves will travel from one float to the next without creating any rotation between the two.

Woolley and Platts say that a float should be about a quarter the length of the waves it operates in. Clearly waves aren't always the same length; but if a float is short enough to extract energy from the shortest useful waves it will also be able to take some energy from longer waves.

In fact, while a big wave carries more energy than a small wave there are more small waves than big waves. So while an optimised float might miss some of the energy in big waves it will operate more efficiently in the more frequent small waves.

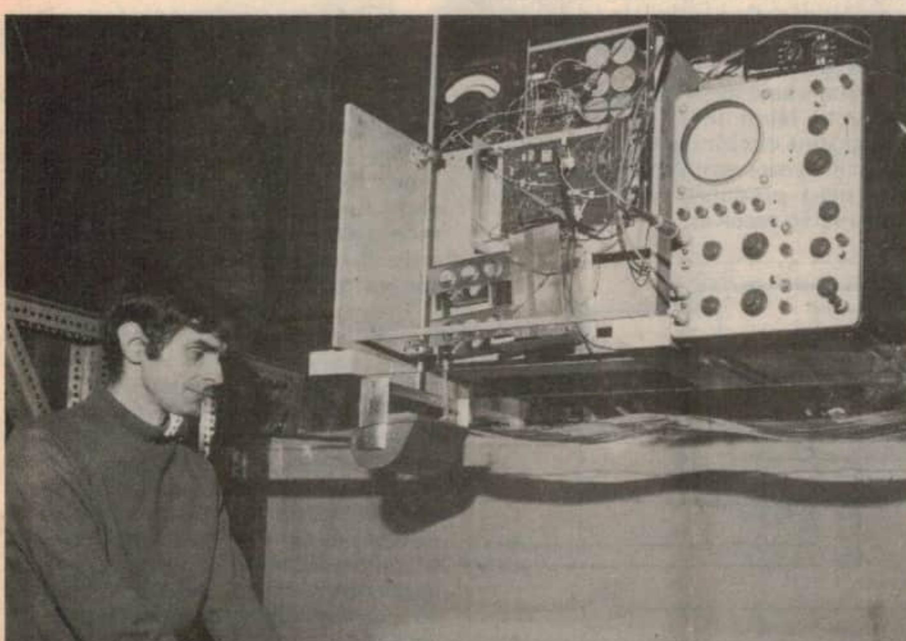
Wavepower's engineers have calculated that a wave-power float system operating in the Atlantic should have floats about ten metres long and the floats might be between 20 and 40 metres wide.

Clearly it could take a lot of work to translate small models into large engineered systems, but Wavepower believes its ideas can be put into operation with very little development. According to Woolley and Platts: "All the parts of such a device, even on a full ocean scale, are well within current technology and we believe that a system of floats could be developed relatively quickly. All the components can be mass produced, which makes a considerable difference to cost."

A float system could be built up a bit at a time, as money was available or as energy was needed. And if anything went wrong it would be possible to take out a single float and put a temporary bridging piece in its place while the float was repaired. So servicing operations would not bring the system to a halt.

It is interesting that an idea as unconventional as wave power has received so much support. The Department of Energy in London explains its interest in terms of an "insurance policy". It expects that Britain will meet most of her future electricity demand from nuclear power stations but if it was ever necessary to turn away from nuclear power, there would be a desperate need for an alternative system. Wave power could be that alternative.

Even Britain's Central Electricity Generating Board (CEGB), the world's largest electricity utility, is showing interest and has begun its own assessment. According to a CEGB study: "The need for an insurance policy to guard against possible adverse circumstances in the future justifies a small program of research in this area."



Dr Stephen Salter with his test tank at the Department of Mechanical Engineering, Edinburgh University, Scotland. Dr Salter has been awarded £110,000 by the British Government to continue investigations into sea wave energy conversion.

British scientists study alternative energy sources

Machine tools driven by centralised hydraulic power instead of individual electric motors, geothermal power stations, solar power and wind power—these are some of the ideas being examined by a new British think tank called the Energy Technology Support Unit. Set up by Britains Department of Energy, the unit is located at Harwell in southern England.

The team is cautiously enthusiastic about the possibility of developing geothermal power in Britain, particularly in Cornwell in the south-west. Rising oil prices have dramatically altered the economic picture for the expensive drilling required, while the granite outcrops in Cornwell bring "hot rocks" relatively close to the surface.

Solar energy for water heating is considered a potential economic proposition, for south-west Britain at least. Installation costs will, however, need to be reduced considerably.

Wind power is considered a much less attractive proposition than wave power. The problem here, of course, is what to do when there is no wind, since long term storage of electricity is not feasible.

According to the experts there will be big problems in the rapid expansion of nuclear fission, the world's oil resources cannot last forever, and the dream of unlimited power by means of nuclear fusion will not begin to be realised until well into next century. There will thus be a growing need for alternative energy sources towards the end of the century.