‘Energy from our Oceans’

Ireland's first Wave-Energy Generator arrives in Galway

PRESS RELEASE: March '06

The power of the Atlantic is about to be harnessed in a Marine Institute / Sustainable Energy Ireland (SEI) initiative to open a wave energy test site a mile and a half off the coast of Spiddal, Co. Galway.

The 37-hectare site will be open to entrepreneurs and engineers to test prototype ocean energy generators. The first wave energy generator, 'Wavebob,' has arrived at Galway Docks and will be deployed on the Spiddal site early next week. This marks the first visible step in a national programme to become leaders in ocean energy technology.

The Marine Institute and SEI have to date invested €300k in university based research and a further €850k in industry based research of ocean energy technology. Together with significant private investments by entrepreneurs such as William Dick, Wavebob Ltd., the initiative is beginning to bear fruit. Both agencies have been working closely to develop a research and development strategy for ocean energy technology in Ireland. This strategy will define a phased approach towards product development together with an outline of the investment levels required to sustain the development of an ocean energy industry in Ireland, further details of which are expected to be announced shortly by the Department of Communications Marine and Natural Resources.

Wavebob has already gone through a rigorous path of theoretical modelling followed by small-scale prototype testing in wave tanks. Some of this testing has been performed at the Hydraulics and Maritime Research Centre, UCC. This method of steady development is essential in order to confirm the potential of the device while minimising the risks and costs associated with the development process. The next critical step in the development process is to test the device in the sea. Wavebob have chosen to test a quarter scale prototype, which it is anticipated will provide the most accurate evidence to date for the cost and performance potential for the device. The quarter scale model was built in Belfast's Harland & Wolfe Shipyard and has received €200k in grant support from SEI.

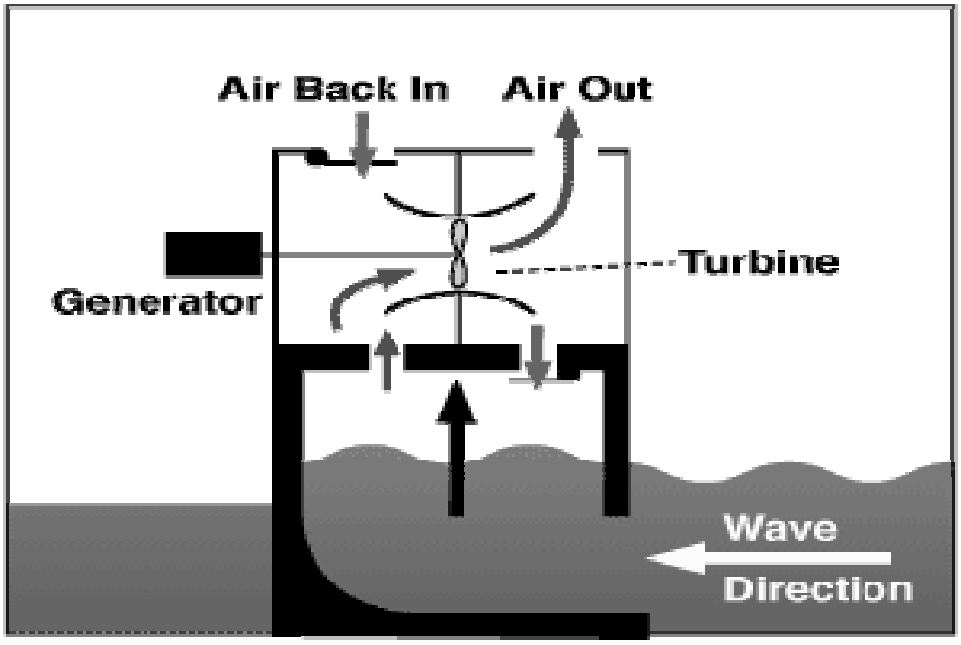
"The most energetic waves in the world are located off the West coast of Ireland," explains Dr. Peter Heffernan, CEO Marine Institute. "The technology to harness the power of the ocean is only just emerging and Ireland has the chance to become a market leader in this sector."

David Taylor, CEO of SEI commented that "SEI is committed to innovation in the renewable energy sector. Wave energy is a promising new renewable energy resource which could one day make a significant contribution to Ireland's electricity generation mix thereby further reducing our reliance on fossil fuels".

In addition to the Wavebob, there are several other Irish ocean energy technology developers in operation, so it is hoped that the Galway Bay test site will be used to field test a number of other exciting Irish wave device designs over the coming years.

It is expected that the implementation of the Ocean Energy Development Strategy over the coming years will see a progressive increase in the range and scale of research and innovation investment.

Ocean Energy



The world's ocean may eventually provide us with energy to power our homes and businesses. Right now, there are very few ocean energy power plants and most are fairly small. But how can we get energy from the ocean?

There are three basic ways to tap the ocean for its energy. We can use the ocean's waves, we can use the ocean's high and low tides, or we can use temperature differences in the water. Let's take a look at each.

Question?

Why do you think there are so few ocean energy plants?

Wave Energy

Kinetic energy (movement) exists in the moving waves of the ocean. That energy can be used to power a turbine. In this simple example, to the right, the wave rises into a chamber. The rising water forces the air out of the chamber. The moving air spins a turbine which can turn a generator.

When the wave goes down, air flows through the turbine and back into the chamber through doors that are normally closed.

This is only one type of wave-energy system. Others actually use the up and down motion of the wave to power a piston that moves up and down inside a cylinder. That piston can also turn a generator.

Most wave-energy systems are very small. But, they can be used to power a warning buoy or a small light house.

Question?

What factors influence the presence of waves and wave size?

Tidal Energy

Another form of ocean energy is called tidal energy. When tides comes into the shore, they can be trapped in reservoirs behind dams. Then when the tide drops, the water behind the dam can be let out just like in a regular hydroelectric power plant.

Tidal energy has been used since about the 11th Century, when small dams were built along ocean estuaries and small streams. the tidal water behind these dams was used to turn water wheels to mill grains.

In order for tidal energy to work well, you need large increases in tides. An increase of at least 16 feet between low tide to high tide is needed. There are only a few places where this tide change occurs around the earth. Some power plants are already operating using this idea. One plant in France makes enough energy from tides (240 megawatts) to power 240,000 homes.

This facility is called the La Rance Station in France. It began making electricity in 1966. It produces about one fifth of a regular nuclear or coal-fired power plant. It is more than 10 times the power of the next largest tidal station in the world, the 17 megawatt Canadian Annapolis station.

Question?

Why do you think there is such a difference between the energy from burning fossil fuels and the energy from generation by other methods such as tide / wave energy?

Ocean Thermal Energy Conversion (OTEC)

The idea is not new. Using the temperature of water to make energy actually dates back to 1881 when a French Engineer by the name of Jacques D'Arsonval first thought of OTEC. The final ocean energy idea uses temperature differences in the ocean. If you ever went swimming in the ocean and dove deep below the surface, you would have noticed that the water gets colder the deeper you go. It's warmer on the surface because sunlight warms the water. But below the surface, the ocean gets very cold. That's why scuba divers wear wet suits when they dive down deep. Their wet suits trapped their body heat to keep them warm.

Power plants can be built that use this difference in temperature to make energy. A difference of at least 3.3 degrees Celsius (or 38 degrees Fahrenheit) is needed between the warmer surface water and the colder deep ocean water.

Using this type of energy source is called Ocean Thermal Energy Conversion or OTEC. It is being demonstrated in Hawaii.

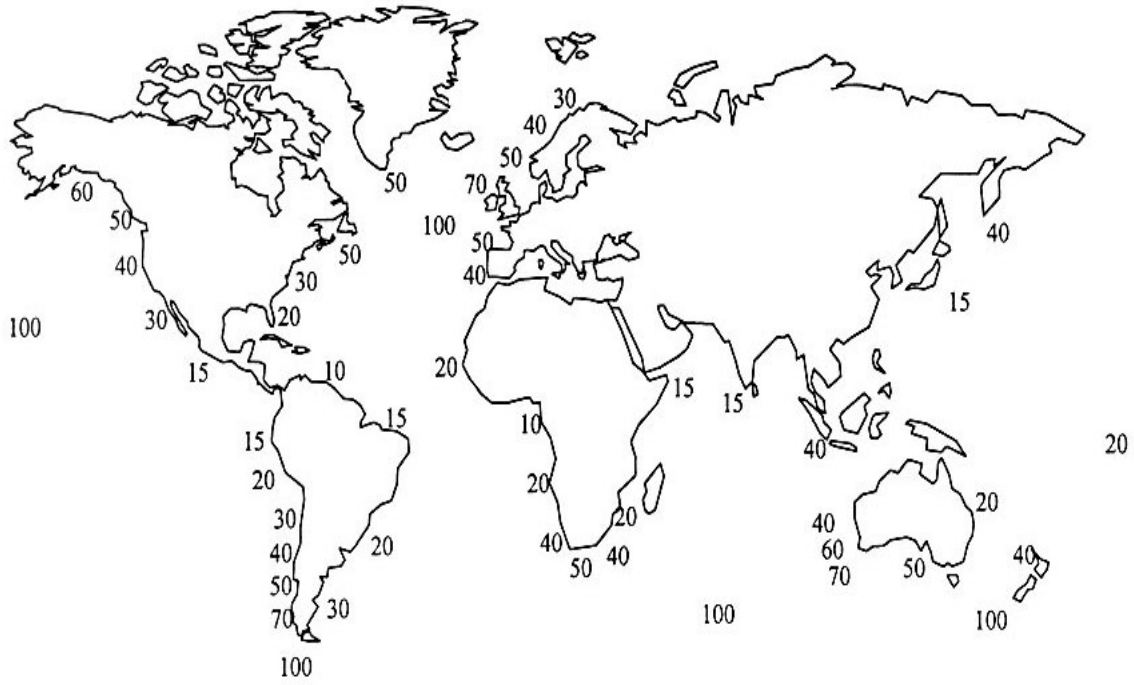
Resources on the Web

www.sei.ie/index.asp?locID=1034&docID=-1

www.sei.ie/uploadedfiles/InfoCentre/reportecotec.pdf

Ireland and Ocean Energy

Fig 1



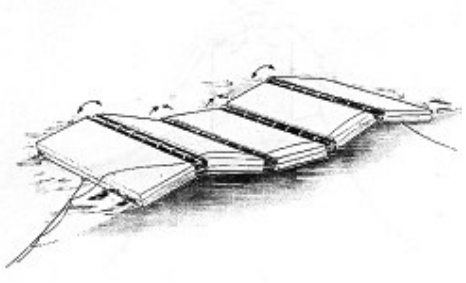
Source: T W Thorpe, ETSU, November 1999
Fig 1 Approximate global distribution of wave power levels (kW/m of wave front)

The exceptionally rich wave power resource of the NE Atlantic is clearly evident in Fig 1, which shows the effects of the prevailing wind circulation, with long wavelength seas driving towards the west coasts of Ireland and Scotland.

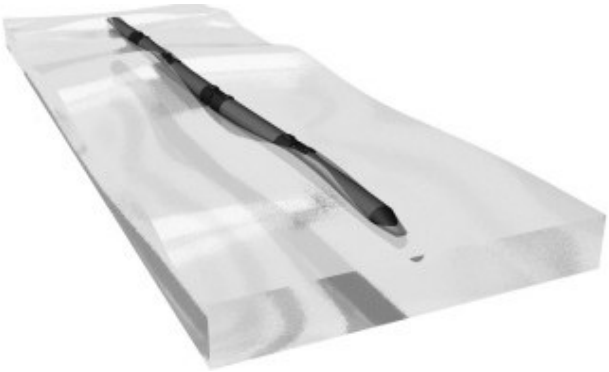
In terms of potential usefulness, the wave climate off the West coast of Ireland is one of the most favourable in the world and certainly the most conveniently placed. The average annual wave height in deep waters off the Mayo / Donegal coast is over 3.5 metres, with a period of close to 10 seconds. In winter months the figures are much higher. In energy terms, wave power for January regularly exceeds 150kW/metre length. The peak figures for the extreme seas are far higher and more powerful again; the 100-year 'design wave' off the Irish west coast is taken to be 35 metres from trough to crest. In seeking to exploit this potential

source of energy, there is therefore an accompanying engineering challenge in designing for such severe conditions.
As they near the shore and the water becomes more shallow the waves begin to lose power due to friction with the seabed. So in energy terms the offshore resource is greater than near-shore, and both are greater than at the shoreline.

Floating Contour Converter



Pelamis

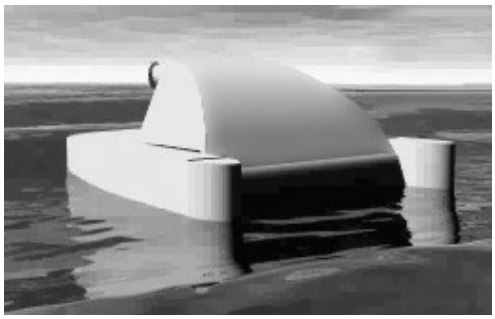


Archimedes Wave Swing

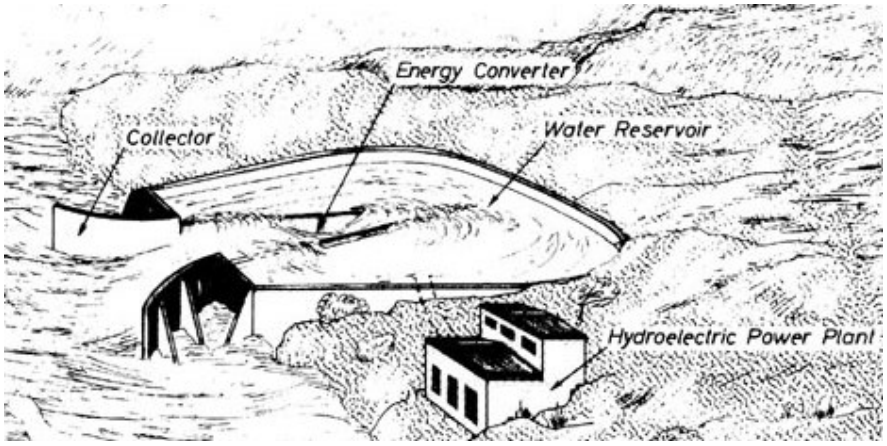
McCabe Wave Pump

Mighty Whale

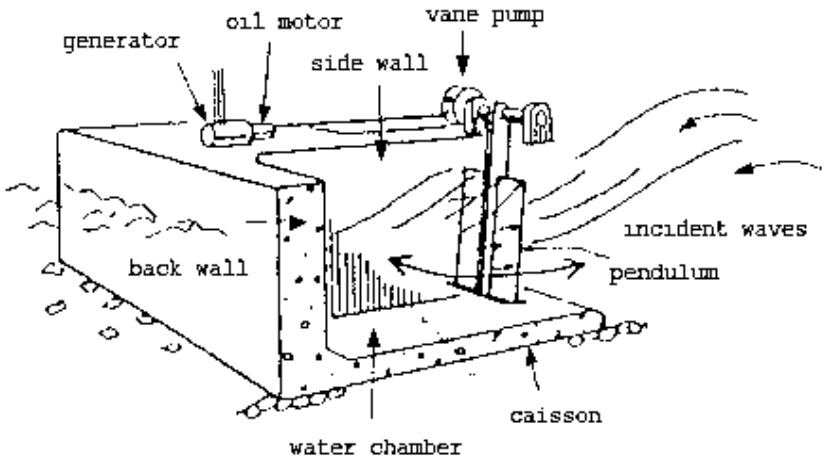
OSPREY



Tapchan



The Pendulor



Variety of Devises

Question?

What do you think are the practical problems associated with installing these or another generator in the sea?

Advantages

The enormous potential export market for wave and tidal energy devices easily justifies the public investment now needed to ensure success.
Growth in the wave and tidal energy industry would help to offset unemployment in the declining offshore oil and gas, and fishing industries. Government investment in wave and tidal energy would thus bring significant economic and social side-effects.

www.marine.ie/NR/rdonlyres/604C705D-0E53-402B-B0CB-800986877477/0/Final2_WaveEnergy1stNov.pdf

Question?

Can you think of another medium to long term advantages regarding the development of such energy resources?