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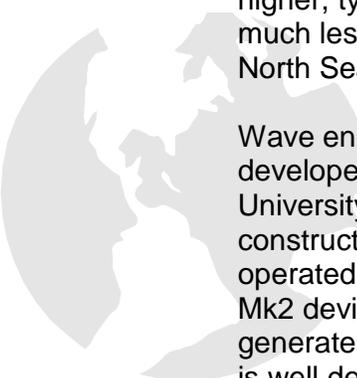
Science and Technology Committee

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### Wave and Tidal Energy

Wave and Tidal Energy technologies have been neglected by successive governments. In the case of wave energy, after some initial enthusiasm some 15 years ago and some financial support, a report was produced by ETSU effectively condemning wave energy as uneconomic for the foreseeable future and funding was withdrawn in favour of wind power, which became the preferred renewable technology, and still is. Tidal power did not reach first base.

It is now appreciated that water based technologies have an advantage over wind and solar in that the energy flux is an order of magnitude higher, typically 4kW per metre squared compared with 400W, often much less, for wind and solar. The average power in 1 metre length of North Sea wave is 40kW rising in storm conditions to as much as 3MW!



Wave energy, despite the cold water poured onto it by ETSU(sic), was developed jointly by WaveGen and Professor Whittaker from the University of Belfast. A shoreline device, now called Limpet was constructed on the Island of Islay, more famous for malt whisky. It operated successfully for ten years and has now been superseded by the Mk2 device which has been operating since November 2000 and generates 500kW from waves rolling in from the Atlantic. The technology is well developed and operating experience is being accumulated. A major problem is transmitting the power to the grid. There is a modest grid line to the remote south west of the island but it must be strengthened to take the 500kW output from the wave generator. The initial quotation was, I understand, £1m which was later reduced to £500.000., still impossibly large. A compromise has been reached but only 140kW can be transmitted leaving a surplus of renewable electricity looking for an application.

This problem of grid connection is common to all renewable sources, especially wind, and in many instances makes a development totally uneconomic. There are several fundamental reasons for this:

1. Distribution grids are “tapered” towards the end and this is often where the renewable energy is available.
2. The current National Grid network was never designed for receiving power from multiple sources as well as delivering it.
3. The Cables connecting England and Scotland are running at full capacity and there is no mechanism for supplying renewable energy generated in Scotland south of the border.

It is no good pointing to the potential for wave energy around the coast of Scotland, or wind for that matter, if grid connections are so expensive that the initiative is stillborn. The quality of the electricity can also be an . . . . .

expensive problem, it must synchronise with the grid if it is to be acceptable and this requires additional electronic equipment. And then the intermittent nature of the supply puts it at a disadvantage with the new electricity trading arrangements (NETA) where fluctuating supply attracts a penalty. It is perhaps surprising that enthusiasts persevere with the technology considering the barriers to success.

Tidal stream energy is ten years behind wave power. One 300kW unit is about to be installed by Marine Current Turbines of Lynmouth in Devon and The Engineering Business have demonstrated a small model device which they would like to upgrade to a demonstration stage but are having difficulty in financing the venture. The science is well understood but the technology requires further development. It is not even included in the Renewable Obligation list of acceptable technologies despite considerable practical potential.

Neglect of wave and tidal stream power is not confined to the UK, indeed the Limpet device is one of the most advanced systems world wide. There are smaller systems powering buoys and remote instrumentation at sea. The Japanese TWG-3 is currently used by Trinity House Light House Service and in Denmark and Japan. Blue Energy in Canada have developed, and tested, a 25kW Darrieus vertical axis turbine or Davis turbine prior to a 30MW version to be constructed in the Philippines. Numerous designs have been developed and tested around the world and over the last ten years a composite set of generating predictions shows initial generating cost of 20 p/kWh in 1980 down to 6 p/kWh in 2001.

Wind power is regarded as the most developed renewable technology and is growing rapidly but from a small base. If all the wind farms in the world were assembled on the South Downs they would only generate 10% of UK electricity. The potential for building wave and tidal stream devices is just as good as onshore wind and the highly concentrated nature of the energy helps in the difficult economics of going offshore; but the technology needs to be demonstrated and encouraged by subsidy of some kind, if it is to develop.

Tidal stream devices are judged to be considerably less obtrusive than wind turbines and barrages and the likely hazard to navigation is no different from that exhibited by current offshore installations. The impact on marine life has yet to be assessed. The success rate for planning applications for new wind turbines is rapidly falling off as public pressure against wind turbines increases and this highlights the advantages that wave and tidal stream based technologies could have in providing a significant amount of renewable energy.

In the UK, the latest New and Renewable Consultation Document describes the new arrangements for encouraging renewable energy. This replaces the system where developments were granted NFFO contracts guaranteeing a good price for all the electricity generated. These

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contracts were bankable and attracted investors. The new arrangements whereby suppliers (RECs) are obliged to provide 10% of their supply from renewable sources by 2010 or pay a penalty, require suppliers to enter into contracts with renewable energy suppliers. But the price of the renewable electricity has been effectively capped at 5p per unit. Wave and tidal stream (and offshore wind for that matter) all come in above this figure so it is difficult to see why suppliers should enter into such contracts when they can buy themselves out at 5p per unit. Such contracts will be short term in any event and not therefore bankable. This is making life difficult for renewable energy developers.

It is clear that further encouragement should be given to the less developed technologies such as wave and tidal stream. Grants for research and development will not be enough to grow these technologies however; their developers must see a viable business ahead of them, with the necessary return on capital to make investment attractive.

Professor Ian Fells CBE FREng  
Crispin D Fells MEng