Ocean Energy

Leah McCabe

Comparisons can be made between the early aviation industry and the ocean energy industry in its current stage of development. In the beginning, the pioneers of 'heavier than air flight' faced nay-sayers at every turn: human flight was an impossible task and their pursuit of this hopeless dream was seen as a waste of time, money and skills. Even if it did work it would never be of use or interest to anyone other than 'enthusiasts'. It would never become a serious business not to mind a lucrative one, and flying would never become a commercial form of transport.

There are small groups of innovators spread all over the globe trying to be the first to come up with a practical, functional and economic ocean energy device that can be put into mass production. It is a race against time and there is nothing like competition to separate the wheat from the chaff. As testing is on-going, weaker projects will fall away, and sturdier concepts will begin to take the lead.

Developers need access to funding to develop new concepts in the first place, and while some farsighted investors are committing to funding, governments are less focused and have tended to look for quick solutions to show they are 'committed' to clean energy. This means that the more complex developments required to extract energy from wave, tide and other sources are somewhat neglected.

This is unfortunate because Ireland is well placed to become a leader in the budding ocean energy industry, with the immense natural resource that is the North Atlantic Ocean on our western coastline and the fast flowing tidal Irish Sea on the east coast. There is a test centre in Galway Bay and another under development in North Mayo. If Ireland can succeed in getting these facilities well supported, we could have other countries queuing up to test their devices in our rough waters.

Our strong research and intellectual background also makes Ireland an attractive option for foreign investment in this young industry and with new interconnection there is the possibility for Ireland to become a net supplier of energy to Europe and beyond.

Wave

Wave energy is the energy that is stored in the movement of waves. Ireland's unique location in the North Atlantic Ocean means that the majority of waves are directed towards the island. The average annual wave height off the west coast is 2.5 – 3m, but is substantially higher in wintertime. This gives an annual average power of somewhere between 30 – 50kW per metre of wave.

One of the advantages of wave energy is that, like wind, it varies seasonally. When the demand for energy is high in the winter, so too is the energy available from bigger waves. The same can be said for the summer months when demand is lower and the seas are calmer. The summer provides a window of opportunity for annual repairs and maintenance to be undertaken when access to machines is more straightforward. However, this variability is one of the arguments used against it, as it is with wind energy.

Due to the nature of wave energy, there is always the chance that there will be a freak wave, a one in hundred year event. Wave energy devices must be able to withstand these infrequent onslaughts without becoming damaged or destroyed in the process. An effective device will also need to respond well to calmer seas and less powerful waves. The design process that is involved in incorporating these requirements is on-going and extremely challenging.

Tidal

Tidal energy has an advantage over both wind and wave energy in the fact that it is regular, predictable and reliable. It is drawn from tidal streams as the tide goes in and out. Water is around 830 times denser than air. This means that an underwater turbine can draw much more energy from the tides than an equally sized wind turbine can from the wind, even when rotating more slowly.

The world's first commercial tidal power station is situated in Strangford Lough, Co. Down, and the device is known as SeaGen. It has 1.2 MW of electricity generating capacity and operates like an underwater wind turbine. It produces enough electricity to power up to 1,000 homes. The rotors turn slowly enough not to pose any significant danger to wildlife.

Tidal devices compare favourably to wave energy devices in the fact that the energy drawn by a single tidal unit can be measured in megawatts, whereas wave device units are measured in kilowatts. This need for multiple wave devices adds costs due to numerous grid connections to the devices.

Challenges

The challenges facing ocean energy are many and varied. The most obvious of these is the harsh environment that the electricity generating devices will be operating in. They will have to endure salt water, storms, wind, constant movement and rust, to name just a few.

However, ocean technology is a very mature technology that goes back generations through shipbuilding and oilrigs. Oilrigs must endure some of the harshest waters on the planet. The expertise needed to overcome the difficulties that the environment poses to ocean energy devices has been developed through years of experience. It is just a case of applying it to this new variety of ocean machines.

Connecting wave energy devices to the electricity transmission grid presents many problems of its own, with underwater cables. Maintenance on these cables is expensive and necessitates the need for experienced and skilled workers. The cost of grid connection becomes a large percentage of the capital cost of ocean energy devices, as it must be paid for by the developer. For this reason the development of 'Ocean energy farms' is essential to keep the infrastructure costs to a minimum and these must be developed close to existing national grid connection points.

Underwater tidal energy devices often come under critical scrutiny for any threats they may pose to wildlife and the environment. Seabed ecosystems can be vulnerable to small changes that could have a huge effect on their habitability.

Tidal barrage systems involve building a large dam-like structure and using turbines to generate electricity. These systems can have a major impact on the surrounding ecosystem and on fish migratory patterns. Because of this factor, more compact single entity tidal stream devices are becoming the preferred option for electricity generation. Wave devices do not encounter these problems to the same extent because they are generally float on the surface of the ocean and do not create any hazards to sea creatures. However, complex mooring systems can be seen as potential obstructions to larger sea dwellers.

Targets

The present target for the deployment of ocean energy devices in Ireland is 500 MW of installed capacity by 2020. This target was set by Sustainable Energy Ireland (SEI) and the Marine Institute. There is an interim target of 75 MW by 2012.

This is an ambitious target, but with targeted support, it can be achieved through Irish innovation. If we wait for somebody else to come along with an idea, it will end up that we will have to buy in to keep control of our ocean resource. For this reason the government must considerer the concept of 'licensing' areas for construction of off shore farms in the same way as licensing mineral exploration sites. Otherwise there will be no net return to the country for the use of our national resource. Such future returns can be used to fund the current investment required.

Conclusion

Ocean Energy has the potential to play a considerable role in Ireland's future electricity generating portfolio and the future wealth generation of the state. It is a clean, environmentally friendly option, there is an almost infinite 'fuel supply' and with diminishing fossil fuel resources and rising electricity prices, it is an obvious alternative which brings additional benefits. Being a centre for green reasonably priced energy makes us a potential location for other new developing industries.

Leah McCabe is a 2nd year Mechanical Engineering student at University College Dublin and a member of ENI 2009, an undergraduate summer research project team.
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