



(1/2)

## CARWYN FROST

JOB TITLE: PhD Research Student

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HIGHEST QUALIFICATION: BEng Mechanical Engineering

**CARWYN IS A MECHANICAL ENGINEERING RESEARCHER;  
HE RESEARCHES TURBINES TO HARNESS TIDAL ENERGY**



### The idea

The UK is in a unique position of being an island nation, with one of the highest tidal ranges in the world. This relatively untapped resource has great potential to contribute significantly to the UK's energy mix. The Tidal energy resource is not only abundant but also predictable. These factors were inspirational in finding and supporting a sustainable technology such as free stream tidal turbines. The research stems from the desire to develop an emerging technology as it strives to meet the challenges of the marine environment and meet the requirements of economics.

### Collaboration

The tidal energy community is very active and collaborative; working with others is a great way to develop the research. This can be done through regular internal meetings within the CMERG (Cardiff Marine Energy Research Group) and attending conferences to meet other likeminded researchers and developers. Being one of the lead universities as part of the SuperGen grand challenge has also made working with other universities much better.

### Funding

The research is funded by Engineering and Physical Sciences Research Council - EPSRC which is the UK's main agency for funding research in engineering and the physical sciences. As well as Mabey Bridge Ltd, a fabrication company in Chepstow.

### Impact

The research does not have a direct link to the public, however it is of importance to the public as part of the commitment to reduce greenhouse gases and diversify the UK's energy mix. As these devices will be installed in UK waters the public must have confidence in the technology.

### Publication

Public engagement is important; this is mostly done in the form of presenting at conferences and journal publications which are accessible to the scientific community as well as general public. Additional information can also be found at [www.cmerg.engineering.cf.ac.uk](http://www.cmerg.engineering.cf.ac.uk).



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(2/2)

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### PUPIL QUESTIONS FROM THE EVENT ...

#### **What's the main reason the UK doesn't use more tidal energy?**

The main reason the UK does not use more tidal energy is economics; the technology is available but must be developed further to reach commercial viability. This requires investment and support from government as well as industry.

#### **Do you think it's possible to combine the techniques behind tidal and wind turbines to make a really efficient method of generating electricity? Has this been done already?**

To use both tidal and wind turbines in a joint venture has been considered but would require finding suitable locations with high tidal flows and favourable wind conditions. These two requirements may not overlap very often as tidal energy sites tend to be around headlands or between islands and a mainland, where the wind maybe hampered due to those same features. With free stream tidal turbines still in their pre-commercial phase, focus is primarily on proving the technology at the most favourable sites.

#### **Is it complicated to do maintenance work on a tidal turbine?**

Yes, this is something many developers are seeking to overcome. One option is to reduce the cost of maintenance if not the complexity by extending the maintenance period as long as possible. This must be considered at the design stage as the system must be designed to withstand the harsh environment for such extended periods of time. The importance of condition monitoring is paramount here as that enables remote assessment of the turbine. This gives more detail as to the nature of the likely failure modes thus informing and reducing the complexity of the maintenance required.

#### **How much do the turbine manufacturers consider the effect these machines may have on marine wildlife? It could be very noisy!**

This is of utmost importance and strict monitoring of marine behaviour has been conducted around demonstration devices. The turbines rotate too slowly to cause concern to marine life, whilst the noise has caused little change in the behaviour of marine mammals at these demonstration sites.

#### **How long do tidal turbines usually last?**

A very good question, unfortunately the answer has yet to be found. This is highly dependent on the device design and flow regime it is placed into. Most designers are however striving for a 25 to 50 year device lifetime with regular maintenance.