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The wave energy research and development challenge

The wave energy industry is currently at a significant juncture in its development. The last ten years has seen significant investment in the development of wave energy converters (WECs), specifically Pelamis and Oyster, but little concrete progress appears to have made relative to the investment. Whilst the commercial development of wave energy is not a direct research challenge, it is important that research undertaken supports the wave energy industry in reaching commercialization because otherwise wave energy is in danger of becoming irrelevant.

A review of the current state of wave energy indicates that we can relatively accurately predict the performance of WECs, as well as the structural loads that they are likely to experience. In addition, there is a significant amount of research supporting the optimal design and control of WECs from a power performance perspective. Looking at the abandonment of recent WEC prototypes, it was typically not the power performance that was an issue, but engineering details such as the performance of connectors, pipes, valves, etc. as well as the complexity of offshore operations that caused the major problems. Although there is clearly a role for research into improving the performance of these components, the more fundamental research question is - to what extent can we design WECs to avoid these engineering issues? In support of this research, a significant amount can be learnt from forensically studying the "failures" of the prototypes. Leading on from this there is the question - how should we design WECs to minimize the cost of energy? Effectively, research needs to re-focus onto a techno-economic perspective, where the economics considers the full life-cycle costs of the technology. Included in this is development of an economic case for wave energy.

Whilst some of this research may be done in the laboratory or using computer modelling, it will also require the deployment of prototypes both to help identify the key issues as well as to investigate potential solutions. It is suggested that for practical and economic reasons these prototypes should be relatively small, but necessarily, fully-operational devices. This means the research focus, at least in the short to medium-term needs to move from large-scale wave energy exploitation to the development of wave energy converters suitable for niche markets. This is not to argue that research should be defined by commercial requirements, but recognises that if wave energy can be demonstrated for small niche technologies then this can progress to the development and deployment of larger and more powerful devices suitable for large-scale energy production.

Biography

Dr Matt Folley is a Senior Research Fellow in the Queen's University Belfast Marine Research Group. Dr Folley completed his PhD on the design of wave energy converters at Lancaster University in 1991 before moving to join the QUB group in 2000. In 2005 he was seconded to El Instituto Tecnológico de las Canarias where he spent 18 months researching the integration of wave energy with reverse

osmosis desalination systems. Dr Folley is author of over 30 scientific publications in the field of wave energy and has worked on projects for concept development to prototype performance analysis. Within these projects he has worked with key industrial developers including Wavegen Ltd on the development of LIMPET and is co-inventor of Oyster, which was developed by Aquamarine Power Ltd. Dr Folley is currently the chair of the IEC international group for the development of standards for the assessment of the wave energy resource and UK principle expert for the development of international standards for the assessment of wave energy converter power performance. Dr Folley is also a founder and was inaugural convenor of the Wave Energy Converter Array Network (WECAN), which is an international group of experts focused on developing understanding in the performance and impact of wave farms. He has recently edited a book on the numerical modelling of wave energy converters and is currently working as a Temporary Senior Lecturer for the University of Peradeniya, Sri Lanka.