Investigating Offshore Markets for AWE Technologies

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The offshore market is a key target for utility scale AWE operation. Lower foundation moments could lead to early opportunities for AWE: re-powering fixed foundations and floating foundations. Initial investigations have focused on potential technical, financial and safety showstoppers.

Re-powering offshore windfarms offers possible CAPEX savings from re-using major components (foundations, array cables, etc). This could offset costs associated with immature technology and provide a proving ground for AWE operations. Learnings and supply chains could accelerate development of new-build AWE sites.

Floating foundations offer the potential to exploit new markets, with AWE allowing smaller, lower cost, foundations than conventional turbines. Decoupling of the sensitivity components (the airframe) and wave motions further reduces requirements. Static modelling (excluding waves) has been used to size foundations, and understand trade-offs for several classes of AWE device (based on data provided by AWE developers). Financial modelling has then been carried out.

Fatigue life is a key challenge in all cases due to the cyclic loads of lift devices. For re-powering, the majority of the fatigue life of the foundations will have been used, and assessing remaining life for AWE is challenging. For floating foundations, fatigue of moorings and export cables is key, as foundations move under cyclic loads. Mitigating these loads may be a requirement in either case.

Trade-offs found to have a significant impact on foundation design, especially for floating, include: the height of the winch above the waterline; the angle to which the “ground station” can be tilted; and the amplitude of cyclic loads. Accounting for these early in design could have a significant impact on cost.

Finances are unfavourable for re-powering due to the short operational life and the high OPEX associated with immature technology. However, realistic levels of support (feed-in tariffs) could overcome these shortcomings. Early floating shares similar shortcomings, however mature AWE with more generation per foundation (≥6MW) could outperform conventional floating, and potentially compete with conventional fixed foundation.