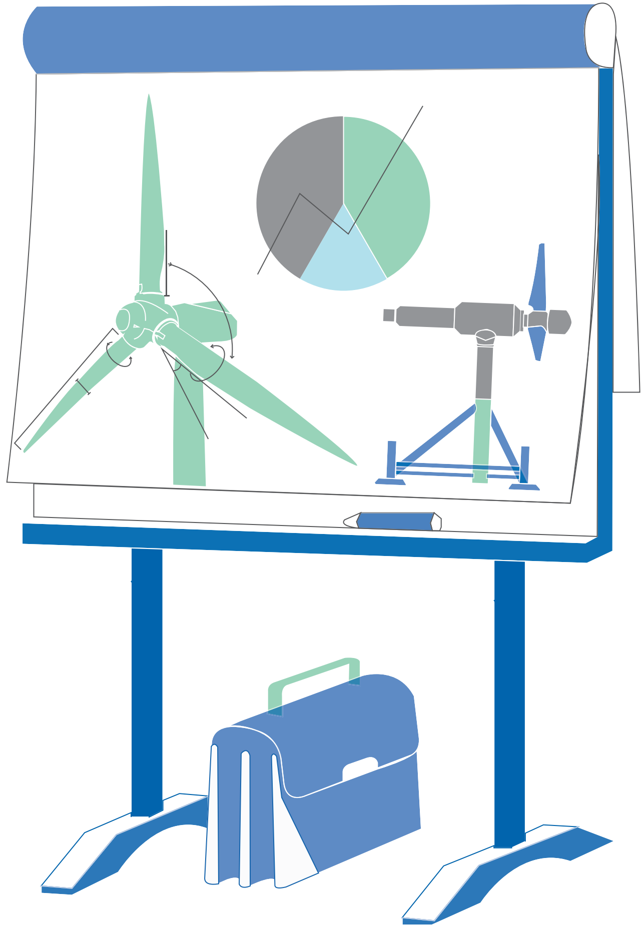
energy technologies institute

An ETI Perspective

Lessons learnt from UK offshore renewables innovation

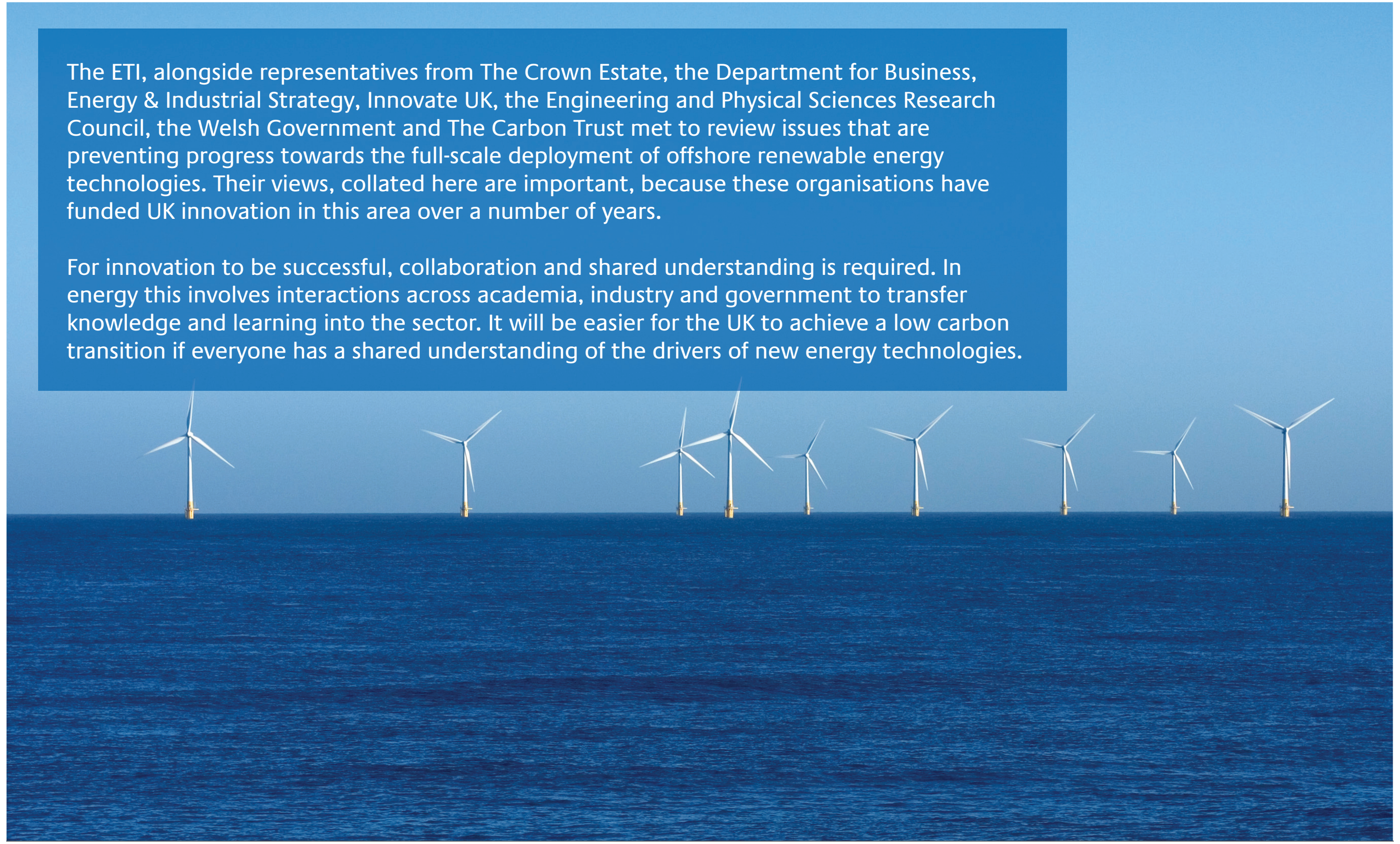


ETI10 TEN YEARS OF INNOVATION 2007—2017

CONTEXT

The ETI, alongside representatives from The Crown Estate, the Department for Business, Energy & Industrial Strategy, Innovate UK, the Engineering and Physical Sciences Research Council, the Welsh Government and The Carbon Trust met to review issues that are preventing progress towards the full-scale deployment of offshore renewable energy technologies. Their views, collated here are important, because these organisations have funded UK innovation in this area over a number of years.

For innovation to be successful, collaboration and shared understanding is required. In energy this involves interactions across academia, industry and government to transfer knowledge and learning into the sector. It will be easier for the UK to achieve a low carbon transition if everyone has a shared understanding of the drivers of new energy technologies.



OFFSHORE WIND

Today, offshore wind energy in the UK is a proven technology. It is being deployed commercially (by the summer of 2016 5.1GW of capacity has been installed) with a credible path to it becoming cost competitive with the lowest cost low carbon technologies. Because of these production volumes the focus for technology development in offshore wind is focusing on improving yields, reducing capital & operational costs and increasing deployment levels. To accelerate this focus, a stable policy and funding environment in the medium to long term would be extremely beneficial.

Offshore Wind has benefited from a long term period of government support through formal subsidies and a policy environment where renewable energy has seen offshore wind to the fore providing investors and the market with some long term signals. This has helped develop the UK market.

Onshore wind power was a well-established energy source and provided offshore with a model to follow. In the UK the acceptance for onshore development has effectively plateaued so has seen offshore emerge as a new market to be developed. Lessons have been learnt from the Danish offshore wind market providing the UK with relevant cost and operational data for the developing market to benchmark against. Being an island, the UK Continental Shelf provides an attractive wind resource and successive leasing rounds have seen larger and more established corporate operators enter the UK market.

These factors together with a government/industry cost target of energy generation of £85/MWh by 2025 provides a strong platform for market development, with capacity scaling up and technology innovation focusing on reducing costs through longer blades, larger gearboxes and floating foundations. The UK is a global leader in offshore wind with as much capacity installed as the rest of the world combined. But further innovation is required to drive cost downwards further and compete on a world stage. Technology development in this sector is driving yield improvement led by accelerated deployments through innovations such as direct drive technology and the increasing size of monopiles used in turbine construction. Further advances are also underway to scale-up capacity, led by innovations in the area of longer blade technology with a focus not so much on just the pure length of blade but in how blades are constructed and how cost can be constrained through new mass market manufacturing techniques.

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of capacity has been installed

TIDAL STREAM ENERGY

The UK has some of the world's best tidal resources and is a world leader in tidal device development which has led to the creation of an established supply chain. The benefits from tidal stream energy are that it is reliable and predictable, the challenge is that to harness it effectively and economically, solutions need to work in the most harshest of environments. Tidal stream energy is undoubtedly at an earlier stage of the innovation chain than offshore wind. However in the case of tidal it is a case that the innovation needs are known, so the challenge to the industry is one of putting those needs together rather than having to look at any large-scale reinvention of technologies.

Key to the industry's chances of success will be the deployment and demonstration of technologies to drive investor confidence. As such the MeyGen Inner Sound project currently under construction in Pentland Firth, Scotland is vitally important. This is the largest tidal stream project currently in the world and by the early 2020s the operators hope they will have deployed 398MW of tidal stream turbines to supply clean and renewable electricity to the UK grid.

A successful project such as MeyGen will help to advance technology design and operation whilst also developing construction and operational experience that can be transferred to larger schemes in the UK and beyond. ETI modelling suggests that tidal stream energy is capable of supplying 20-100TWh of the UK's annual 350TWh electricity demand and the potential impact it can have on UK GDP is estimated to be up to £4.3bn. But to realise this potential there needs to be recognition that reaching cost competitiveness for tidal energy will only be possible if the sector benefits from a clear long-term commitment, including a stable policy and funding environment, further large scale demonstration arrays and targeted innovation.

WHAT MAKES OFFSHORE WIND DIFFERENT TO TIDAL ENERGY?

The biggest engineering challenge for tidal to overcome is the harsh operating environment it has to work within. Tidal is still an emerging industry and does not have the legacy of knowledge (learning from doing) that offshore wind has from its own and onshore development. There is also a difference in the capacity delivery of both technologies.

Tens of GW are predicted for offshore wind against a few GW for tidal stream. Therefore because of this smaller scale need, tidal stream cannot provide the whole energy system with a hedging option that offshore wind can offer in the event of delays in the implementation of nuclear and carbon capture and storage to meet energy and climate targets.

SO WHERE ARE WE TODAY WITH OFFSHORE RENEWABLES INNOVATION?

Offshore Wind

- Is a proven technology that is being deployed commercially with a credible path to becoming competitive with the lowest cost low carbon technologies
- The focus for technology development is now on – improving yields, reducing capital & operational costs and achieving wider deployment
- A stable policy and funding environment into the medium term would accelerate the achievement of energy cost competitiveness

Tidal Stream Energy

- Is at a much earlier stage in the innovation chain
- It's innovation needs are known and the challenge is one of how to put the component parts together in deployable systems rather than having to reinvent the technology
- MeyGen's Inner Sound project, the world's first tidal stream array is pivotal to advancing the technology and developing supply chain capability

Innovation grows through learning. There is evidence that offshore wind has learnt from onshore wind and tidal stream energy can take learnings from offshore wind. But it seems that both industries have to have a real focus on cost reduction to make themselves serious contributors to a low carbon transition in the UK.

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01509 202020

www.eti.co.uk

info@eti.co.uk

@the_ETI