

Installing wind turbines in deep water

The cost-effective installation and operation of large capacity wind turbines in deep water has provided a major step forward for the offshore wind industry.

The need

The UK is committed to sourcing 15% of its energy from renewable sources by 2020 and offshore wind farms have a vital role to play in meeting this target. The further from shore that wind farms are sited, the less likely they are to be opposed by the shipping industry, nature reserves and local residents. In addition, the wind tends to be stronger and more consistent, and larger turbines can be used. However, the depth of water and weather conditions present significant technical challenges in building and maintaining wind turbines in far offshore locations.

The results

In this project, Talisman Energy (UK) Limited led a pan-European consortium of 18 organisations that aimed to develop technologies, techniques and processes for the cost-effective installation and operation of two 5 MW wind turbine generators (WTGs) and their supporting substructures in deep water.

The components that made up each WTG (eg the underwater lattice tower substructure, the towers, the turbines themselves and the blades) were assembled on shore at Nigg Bay in Scotland, and then loaded on a heavy-lift construction vessel and transported to the installation site.

The project proved that lattice-tower design substructures were feasible technically and economically for deepwater wind farms. It also confirmed that the approach of assembling the WTGs on the onshore deepwater quay, transporting them offshore vertically in one piece and installing them in one-lift

onto their substructures was achievable in 44 m of water.

The step changes in technologies and approach pioneered by the project have shown the European offshore wind-farm industry how it is possible to reduce costs by at least 30% and shorten wind-farm development timelines (start of design to completion of fabrication of the first substructure was under 9 months).

A gearbox bearing in each WTG had to be replaced during commissioning, which proved that in-situ changing of major wind-turbine components was feasible and could be completed successfully.

A concurrent study on mass production of substructures showed how, with application of new technologies and adoption of modern manufacturing processes, lattice tower design substructures could be fabricated in volume while reducing costs by up to 40%.



‘The success of this project has accelerated the exploitation of wind energy in deep-water, offshore locations and help the UK to meet its renewable targets.’

TALISMAN ENERGY (UK) LIMITED

Market potential

In the next 10 years, significant growth is expected in the UK offshore wind market. There are 8 GW of installed capacity currently in progress and a further 32 GW are planned (which will deliver 25% of the UK's total electricity needs by 2020) with a combined estimated investment of around £100 billion. In addition, the Scottish Territorial Waters development targets an additional 6.4 GW of installed capacity. Therefore, for offshore wind, this gives the UK a maximum potential

of almost 47 GW of installed capacity.



Next steps

Talisman Energy has decided to concentrate on its core business of oil and gas exploration. However, project partner SSE Generation, through its subsidiary, Airtricity, has a large portfolio of projects and plans to exploit the outputs of the project extensively. SSE expects to have

4,000 MW of renewable capacity in the UK and Ireland by 2013. SSE is investing £1.5 billion in the development of the Greater Gabbard offshore wind farm project. Other consortium members are also actively exploiting the experiences gained from the project.

Technology Strategy Board Driving Innovation

Collaborative research and development projects are one of the tools that the Technology Strategy Board uses to drive innovation in the UK. The Technology Strategy Board is a business-led executive non-departmental public

body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve the quality of life. It is sponsored by the Department for Business, Innovation and Skills (BIS).

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Project partners

Main funding partners:

Talisman Energy (UK) Limited and SSE Generation Limited (a subsidiary of Scottish & Southern Energy)

Other consortium members:

EDF R&D, E.ON Vindprojektering Sverige, Aberdeen University, KTH University, Stockholm University, Strathclyde University, Lund University, Teknikgruppen, Mellanrum Consulting, PB Consultants, Risoe, ECN, REpower Systems, Scaldis Salvage & Marine Contractors, Germanischer Lloyd WindEnergie, Nautilus Associates

Technology Strategy Board investment

£3,000,000

Total project investment

£27,654,948

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