

BWEA Briefing Sheet Offshore Wind

The UK's first offshore wind farm was commissioned in December 2000 off Blyth Harbour in Northumberland. The offshore wind sector has grown in the space of five years from these two experimental turbines to 13 consented projects totalling over 1,155 megawatts (MW). Of these, three projects with a total capacity of 210 MW are already generating for the grid: North Hoyle, off the coast of North Wales; Scroby Sands, off the coast of Great Yarmouth in Norfolk; and the newly commissioned Kentish Flats off Whitstable in Kent. Another project is under construction, the 90 MW Barrow off the Cumbrian coast.

Offshore development is set to increase steadily and the UK's prospects are looking good, with a substantial proportion of the total European offshore wind resource located in Britain's waters. Studies estimate the generation potential at close to 1,000 terawatt hours (TWh) per year, equivalent to several times the UK's total electricity consumption. The UK is presently identified as the best market for offshore wind energy in the world¹, due to its favourable combination of wind resource, strong offshore regime and the extension of the relevant legislation, the Renewables Obligation, to 15% by 2015.



Scroby Sands © E.ON UK Renewables

Technology

Offshore wind turbines are based on the same technology as their onshore counterparts and their expected lifespan is the same, approximately 20 years. The main difference is their size. A typical onshore turbine being installed today has a height to tip of between 100 metres (m) and 120m with the tower height of about 60 to 80m, and blades between 30 and 40m long, whilst most offshore wind turbines are likely to be at the top end of this scale. Modern turbines being erected both onshore and offshore are likely to be generating between 1.5 MW and 3MW with offshore and the most exposed windy sites in Scotland being at the top end of this scale. Currently 3 MW plus turbines are being installed and turbines of up to 5 MW are being prototyped.



Construction of Kentish Flats © Elsam

The physical constraints of transporting large components such as blades do not apply to the same degree offshore, and the costs of installation offshore is much the same regardless of the size of turbines. It is therefore more cost effective to use larger machines that have higher energy yields. Just as onshore, offshore turbines are warranted and tested to withstand extreme conditions, and in the event of severe weather, the blades will automatically turn out of the wind and slow down for safety reasons when wind speeds become gale strength i.e. 50 miles per hour and above. The structural components of offshore turbines are designed and coated to protect them from corrosion by the salt in sea water.



Offshore wind turbines have generally been built in relatively shallow water, less than 30 metres in depth. It is possible to build structures in water deeper than this, most notably the North Sea oil platforms, but it is expensive and would not be economically viable for offshore wind given the current state of development of the technology.



Scroby Sands © E.ON UK Renewables

There are no technical barriers to installing wind turbines offshore, but the construction, delivery to site and assembly of such large machines requires specialist equipment, facilities at ports and careful timetabling to make sure that the possibilities of using calm weather windows are maximised. Most developments will be installed on

either gravity foundations or steel monopiles. Gravity foundations are structures, normally concrete, which settle and are stabilised by sand or water, with the turbine tower fitted onto them. Monopiles are long steel tubes which are hammered, drilled or vibrated into the seabed until secure, and then platforms and towers are installed on top. Most developments in UK waters will use monopile foundations for the foreseeable future.

Development

So far there have been two calls for bids to develop UK offshore wind sites, known as Round 1 and Round 2.

Round 1



The first phase of the UK's offshore wind industry was launched in December 2000. Offshore wind farm developments require a lease from the Crown Estate², whose Marine Estates include over 55% of the foreshore around the UK and beds of tidal rivers, and the seabed out to the 12 nautical mile territorial limit around the UK. The lease term for Round 1 projects is for 22 years and includes timing requirements for the construction of the wind farm, and also covers rent and issues of wind farm operation, maintenance and decommissioning³.

Successful Round 1 applicants were announced in April 2001, with leases awarded for 18 sites at 13 locations, some of them multiple developments. The Crown Estate

assessed bids in terms of financial viability of the candidates, their offshore development experience and wind turbine expertise. The first Round 1 development to be commissioned, North Hoyle, was switched on in December 2003, Scroby Sands followed in 2004, Kentish Flats in 2005 with Barrow expected to start operating in 2006. Site preparation for several others is now well underway.

Intended as a pilot phase, Round 1 sites were limited to a maximum of 30 turbines. Round 1 proposals proved to be successful and developers consequently expressed an interest for larger offshore projects in the second phase of development, Round 2.



Table 1: UK Offshore Wind Farms Round 1

Location	Status	Capacity	Developer/Turbines
North Hoyle	Operating (Dec 2003)	60 MW	npower renewables (Vestas 2 MW)
Scroby Sands	Operating (Dec 2004)	60 MW	E.ON UK Renewables (Vestas 2 MW)
Kentish Flats	Operating (Sep 2005)	90 MW	Elsam (Vestas 3 MW)
Barrow	Construction	90 turbines	Centrica/DONG (Vestas 3 MW)
Gunfleet Sands	Agreed	30 turbines	GE Energy
Lynn/Inner Dowsing	Agreed	60 turbines	Centrica
Cromer	Agreed	30 turbines	Norfolk Offshore Wind/EDF
Scarweather Sands	Agreed	30 turbines	E.ON UK Renewables/Energi E2
Rhyl Flats	Agreed	30 turbines	npower renewables
Burbo Bank	Agreed	30 turbines	Seascope Energy
Solway Firth	Agreed	60 turbines	E.ON UK Renewables
Shell Flat	Pending	90 turbines	ScottishPower/Tomen/ Shell/Elsam
Teeside	Pending	30 turbines	Northern Offshore Wind/EDF
Tunes Plateau *	Pending	30 turbines	RES/B9 Energy
Ormonde *	Pending	30 turbines	Eclipse Energy

* These two projects were outside the original Round 1 process but conform to its terms, Ormonde is an innovative wind-gas hybrid project.

Round 2

Between November 2002 and February 2003, the DTI held a consultation - Future Offshore – on the development of a strategic framework for the UK offshore wind industry³. 20 issues were raised in the consultation, including the consents process and the legal framework, the need for Strategic Environmental Assessment (SEA) and the necessary electrical infrastructure.

Following that, and just days after the publication of the Energy White Paper (February 2003) the Crown Estate asked for expressions of interest in the development of new offshore wind sites. The result of that call, announced at BWEA's third annual dedicated offshore conference in March 2003, pre-registered interest from 29 companies at 70 locations around the UK coastline. In December 2003 the final results of Round 2 were announced, with the right to develop 15 sites totalling 5.4-7.2 gigawatts (GW) awarded to 10 companies or consortia.

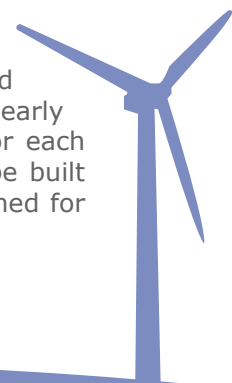


Kit being assembled for Scroby Sands © SLP Energy



Map of Round 2 sites

The Crown Estate and the Department of Trade and Industry (DTI), identified three key areas as appropriate for development in Round 2: the Thames Estuary, the Greater Wash and the North West. Round 2 sites are larger than Round 1 sites and will utilise more powerful machines, at greater distances from shore. While each Round 1 site was awarded for a maximum of 30 turbines, there is no limit for Round 2, and some very large schemes have been awarded sites – two are 1 GW or more in capacity, as big as nuclear power stations. Projects in Round 2 are starting to enter the consenting process. The 1,000 MW London Array development submitted its Environment Statement in June 2005 and other projects will enter the system during 2005 and in early 2006. Consenting is expected to take about a year for each project. The first turbines for these projects will not be built until 2008 at the earliest, with most construction planned for 2009 and beyond.





North Hoyle © npower renewables

Licensing

As with onshore wind farms, offshore proposals go through a stringent assessment process to obtain all the necessary planning permits. To reflect the different circumstances offshore, the consenting regime is different. The key consent is under Section 36 of the Electricity Act 1989, administered by the Department of Trade and Industry, which is required for all generating stations of 50 MW or more. In addition, consents from the Department of the Environment, Food and Rural Affairs (Defra) are required under Section 5 of the Food and Environment Protection Act 1985 and Section 34 of the Coast Protection Act 1949. Some Round 1 projects have also applied to Defra for consent under Section 3 of the Transport and Works Act 1992, as this allows for the management of navigational issues, a key legal protection for wind farm developers. In the Energy Act passed by Parliament in July 2004, this power is brought within the Section 36 regime.

Some of the Round 2 sites are more than 12 nautical miles out to sea, and therefore outside the UK's territorial limit. In order to have the legal powers to licence and consent wind projects in this area, the Government has legislated to create Renewable Energy Zones (REZs) into which it can extend the Section 36 consenting regime. This power is contained in the Energy Act that gained Royal Assent in July 2004.

The DTI forecasts that Round 2 offshore wind farms could power 1 in 6 UK homes by 2010. With continued political commitment, industry goodwill and public support, harnessing the power of the wind will generate not just clean electricity for millions of homes across the country, but also a new industry for Britain.

Table 2: UK Offshore Wind Farms Round 2

Location	Maximum capacity (MW)	Developer
Docking Shoal	500	Centrica
Race Bank	500	Centrica
Sheringham	315	Ecoventures/Hydro/SLP
Humber	300	Humber Wind
Triton Knoll	1,200	npower renewables
Lincs	250	Centrica
Westermost Rough	240	Total
Dudgeon East	300	Warwick Energy
Greater Gabbard	500	Airtricity/Fluor
Gunfleet Sands II	64	GE Energy
London Array	1,000	Energi E2-Farm Energy/Shell/ E.ON UK Renewables
Thanet	300	Warwick Energy
Walney	450	DONG
Gwynt y Mor	750	npower renewables
West Duddon	500	ScottishPower
TOTAL	7,169	

References

- 1 Ernst & Young (2005), Renewable Energy Country Attractiveness Indices August 2005, Ernst & Young Renewable Energy Group
- 2 For more information go to www.crownestate.co.uk
- 3 DTI (2002), Future Offshore, A Strategic Framework for the Offshore Wind Industry
- 4 For the latest UK wind energy statistics go to www.bwea.com/ukwed
- 5 For other Briefing Sheets in the series go to www.bwea.com/energy/briefing-sheets.html

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