

What does the Round 3 announcement mean?

Briefing note on offshore wind energy



BWEA is the trade and professional body for the UK wind and marine renewables industries. Formed in 1978, and with 548 corporate members, BWEA is the leading renewable energy trade association in the UK. Wind has been the world's fastest growing renewable energy source for the last seven years, and this trend is expected to continue with falling costs of wind energy and the urgent international need to tackle CO2 emissions to prevent climate change.

Notes

1. Employment opportunities and challenges in the context of rapid industry growth, Bain and Company, 2008, www.bwea.com/pdf/publications/Bain%20Brief_Wind%20Energy%202008_FINAL.pdf 5.
2. BWEA State of the Industry report Oct 2008 http://www.bwea.com/pdf/publications/industry_report_08.pdf
3. <http://www.carbontrust.co.uk/emerging-technologies/current-focus-areas/offshore-wind/pages/offshore-wind.aspx> and <http://www.energytechnologies.co.uk/Home/TechnologyProgrammes/offshore.aspx>
4. <http://www.theccc.org.uk/reports/progress-reports> Figure 5
5. WWF Managing Variability, 2009, http://assets.wwf.org.uk/downloads/managing__variability_report.pdf
6. Germanischer Lloyd and Garrad Hassan, 1995. Study of Offshore Wind Energy in the EC.
7. The UK Renewable Energy Strategy, July 2009. Cm 7686, www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx

Introduction

This week marks the announcement of the winners of the third tender round for offshore wind sites in the UK. Nine development zones will be allocated to companies and consortia to start the development process. The scale of this project represents a step change for the global industry and to understand the implications we need to explore what can be delivered over the coming years and what this means in terms of jobs and opportunities for the UK.

Key facts

- UK is leading the world in the scale of offshore wind development
 - Round 3 will develop across nine zones and the capacity of the leases issued is expected to be at least 25 gigawatts (GW).
 - Taken together with earlier rounds of offshore wind development, Round 3 will mean over 40GW of sites are currently being brought forward.
 - If just 20GW of offshore capacity is developed by 2020 it will secure up to £60 billion of private investment and could create 45,000 UK based jobs.
 - Projects currently operational in the UK have a capacity of 688 MW, across 9 projects, and this represents 228 turbines. A further 1156 MW of projects are under construction.
 - There are currently over 1500 MW of offshore wind installed globally. This is 1% of the 150 GW of total installed wind capacity on and offshore in the world.
 - Research is underway to develop a UK-build offshore wind turbine with a capacity of 10 MW.
- The key obstacles to developing Round 3 are a lack of offshore grid connections, rising production costs and limited existing supply chain capacity.
 - o The Government is currently developing a new offshore transmission network regime to manage Round 3 grid connections. The arrangements put in place must be efficient, cost effective and meet the generation timetable and scale planned in Round 3. The final arrangements put in place must be tailored further to the generation timetable and scale planned in Round 3. This should incorporate more developer choice.
 - o The industry is experiencing a 'cost hump' with costs roughly doubling from £1.5m per MW in early Round 1 projects to £3.1m for Round 3 – this has been driven by the falling exchange rate, historically high commodity prices and a lack of competition among manufacturers. However, falling material costs, a UK based supply chain avoiding import costs and increased competition is expected to significantly reduce costs as the industry expands. New technology and learning by doing will bring down costs as well.
 - o Offshore wind is currently only 1% of the world wide wind market and as such has a small supply chain, dominated by just 2 turbine manufacturers. The dramatic increase in market size represented by Round 3 is expected to attract several new players to the market helping to increase supply. We expect six manufacturer companies to be in the market by 2015. The Renewables Obligation attracts investment to the UK and is part of the driver that could create a UK offshore wind industry.

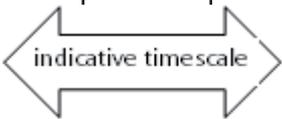


Round 3

Offshore wind is developed in a series of competitive leasing rounds. Two rounds have been completed and these projects are now being developed. At the end of 2007 the Government initiated the process for starting a third competitive round. The Crown Estate as landlord and steward of the seabed started the Round 3 process in June 2008. This week's announcement represents the conclusion of this competitive tender process.

This round was structured differently from previous leasing rounds, as tenders were put forward for nine zones of development each potentially containing multiple projects. The scale of some of these zones is much larger than anything seen before with some zones potentially yielding 10 gigawatts (GW) of projects. In total the size of Round 3 is anticipated to be at least 25 GW compared to the combined total of 8 GW from Rounds 1 and 2.

Another new feature of Round 3 is that within this process the Crown Estate will co-invest with developers, with the aim of facilitating efficient delivery of the wind farms.

Round 3 timeline	December 2007	Jan 2008 to June 2009	March 2009 to Jan 2010	January 2010	2010-12	2012-13	2013-15
Government	Round 3 process initiated	Strategic Environmental Assessment					
The Crown Estate			Round 3 Tender	Round 3 winners announced			
Industry Developer					Project consenting process	Financial investment decision	Construction of wind farm
					Grid connection process		

Round 3 Offshore Wind Zones

Wind farm	Region	Estimated MW
Bristol Channel	South West	1500
Dogger Bank	North Sea	9000
Firth of Forth	Scotland	500
Hastings	South	500
Hornsea	North Sea	3000
Irish Sea	Irish Sea	5000
Moray Firth	Scotland	500
Norfolk	Southern North Sea	5000
West of Isle of Wight	South	500
Total		25500

Analysis of Round 3

With the Round 3 announcement industry now has the opportunity to deploy on a large scale and prove the contribution it can make to the battle against climate change, the supply of UK electricity and the creation of jobs.

The scale of Round 3 is much larger than anything that has been attempted before and in order to deliver in large quantities and on a timeframe that will make a contribution to the UK's 2020 targets, there are key factors that must be addressed to release the constraints on the expansion of the industry such as grid connections, rising costs and supply chain.

The benefits of offshore wind

The UK is already the leading market for offshore wind development in the world, with just under 700MW operational, over 1,000MW under construction and a further 3,500MW consented.

Wind developers are currently setting out plans to deliver at least 40GW of capacity offshore across all leasing rounds, this represents up to £120 billion of private sector investment.

BWEA commissioned Bain and Company to produce a report that modelled the number of jobs that could be created in the UK by the growth of wind energy¹. In a scenario where 20 GW of offshore capacity were constructed by 2020 and 70% of the design and manufacturing took place in the UK then nearly 45,000 British jobs would be directly created, with an additional 14,000 created by onshore wind industry growth.

Table 1. Direct jobs that could be created by offshore wind

	Number of jobs
Planning & development	3,382
Design & manufacturing	20,909
Construction & installation	10,598
Operations & maintenance	6,734
Technical, financial & legal services	1,121
Total offshore	42,745
Total onshore	14,000
Total	56,745

There are further benefits to increasing the amount of wind energy generation in the UK. With less reliance on the import of oil and gas from other countries, then the UK becomes less vulnerable to restrictions in supply or in changing prices. With one third of the UK's existing power plants coming offline coming in the next ten years the most recent OFGEM report concludes that replacing this with fossil fuels, mainly gas, could cost consumers up to 60% more on household bills - due to fossil fuel price volatility. The report also stated that the price of oil has quadrupled over the last 10 years, and the price of coal and gas has doubled.

Supply chain

The scale of Round 3 will require a dramatic increase in manufacturing capacity for offshore wind, such as turbines, foundations, offshore electrics and installation vessels.

Building confidence is key to persuading companies to invest in increased supply chain capacity. The Government's role is central in providing a stable policy framework against which investment decisions can be made.

The UK is already beginning to see examples of new factories being built such as JDR Cable's new inter-array cable facility at Hartlepool and Skykon's investment in new capacity at their Welcon Towers subsidiary in Campbeltown. However, the size of the UK's Round 3 alone represents a step change in demand. Industry will need to dramatically increase capacity in the key supply chain constraint areas including offshore specific wind turbines, installation vessels and in manufacturing capacity for cables to link the wind farm to shore.

A major concern is whether new manufacturing facilities will actu-

ally be built in the UK close to the new market, or whether they will be based on the continent where there are already established onshore wind turbine manufacturing facilities. While onshore wind manufacturing is dominated by Denmark, Germany and Spain, as a new area of business offshore wind offers opportunities to new entrants from both overseas and the UK to emerge as market leaders in innovation and the supply of technology to create a British based supply chain.

Key to attracting this new investment is the creation of coastal manufacturing hubs, much like Aberdeen is a centre for the North Sea oil industry through the development of improved UK port to provide companies with the space and quay facilities they need – a key requirement for offshore wind construction. If offshore wind turbine manufacturers decide to locate new factories in the UK, then new opportunities will also arise for existing manufacturing companies in other sectors such as automotive and aerospace to enter the market for component supply such as gearboxes, bearings, castings and other internal components.

A solid skills base will be required to build industry. The emerging offshore wind industry can draw on the engineering excellence and maritime history of the UK; however industry will need to be



Hartlepool Harbour, JDR Cable's facility center right

mindful of potential shortages in the number of suitably qualified and experienced new candidates. Addressing the most immediate demand for installation, operation and maintenance skills will be prioritised. Support for the wind industry's efforts in developing UK wide training scheme for apprentices is central to ensuring that there is a big enough pool of skilled workers in the UK to meet demand.

Costs and technology

Offshore wind has suffered from a major 'cost hump' in the last few years, due a combination of external factors such as the falling UK exchange rate, rising commodity prices such as steel and an underdeveloped supply chain. The costs of constructing offshore wind turbines have effectively doubled from £1.5m per MW for early projects to £3m per MW currently. However, industry analysis anticipates that costs will start to fall significantly as the market expands in size, attracting new suppliers and creating a UK based supply chain.

There are currently 150,00 MW of wind farms operational worldwide, however only 1,500 of this (1%) is offshore. As such there has been little incentive for suppliers to invest in new offshore manufacturing capacity. This will change dramatically as Round 3 alone will represent an increase in global installed offshore capacity of at least 16 times. Increased competition in the turbine supply chain will reduce costs as new turbine manufacturers enter the offshore specific market which is currently dominated by two manufacturers. Industry projections are that there will be around half a dozen major manufacturers in the market by 2015.

Although the costs of installation offshore are higher than onshore, there are higher wind speeds offshore and therefore more electricity and revenue can be generated per installation. Offshore also provides an opportunity for larger machines and economies of scale from bigger wind farm projects.

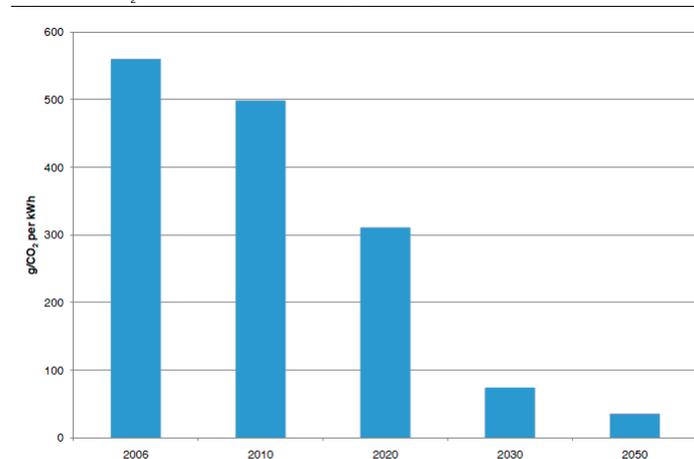
Offshore wind is still a relatively new technology. As experience is gained, costs will come down. A crucial factor in the reduction of costs will be the development of new technology. The UK already has several schemes designed to enable research into new turbines, new foundations for offshore structures and other attributes to optimise the production of electricity².

The Renewables Obligation supports offshore wind and creates a 'virtuous circle' where projects can deploy and so gain the experience they need to bring down costs and reduce financial support. Without this support the UK will miss the boat by not attracting companies to invest and establish a new UK industry with all the jobs and benefits that this will create.

The UK Electricity Grid

Every power station requires a connection to the electricity grid to supply customers in homes, offices and factories. The expansion of offshore wind will mean that new connections will need to be made. Currently large sections of the UK grid require replacement as this infrastructure has come to the end of its natural life; up to 60% will have to be upgraded or entirely replaced in the next 5-10 years. This creates an opportunity to rebuild the grid system for 21st century technology, which can accommodate decentralised green energy supplies, including a new offshore grid network. Work is already underway through the Government's Electricity Network Strategy Group, which consists of industry, Government, National Grid, Scottish grid operators and Ofgem representatives who have analysed the existing network to identify the major upgrades that are required and map the new grid routes required.

Figure 5 CO₂ intensity per kWh of electricity generated, 2006-2050



Source: CCC

National Grid has a responsibility to manage the supply of electricity minute by minute and day by day to ensure that the UK demand is met. Electricity suppliers choose and contract generation to supply their customers and each is incentivised to match their own supply and demand. As GB Transmission System Operator, National Grid is responsible for managing any residual imbalance by contracting with generators and suppliers to modify generation or demand in real time.

Wind power may be variable, but over the whole of UK/GB varies very slowly and is highly predictable in the short term. Also, because wind generator sets are small (around 2-3MW) compared to conventional generation units (up to 660MW) the impact of one, two or more generator faults on the system is much smaller for wind than for conventional power generation. National Grid's own figures show that it can successfully manage a much larger proportion of wind energy on the system with little or no adjustment³.

The electricity system requires a surplus of generation capacity so that even when power stations are under maintenance or have broken down there is enough capacity to meet the demand. For most of the year at times of normal or low demand, and especially with high power station availability, many power stations are idle or shut down. The UK's current reserve margin is in the region of 25%, with an overall electricity generation capacity of 80GW, compared to a peak demand of 63GW and average demand of 44GW.

In the longer term there could be much more wind on the system and this will require more active

management of the grid. This is likely to mean keeping some conventional capacity available to run in periods of low wind but high demand. However, the amount needed can be significantly reduced through a number of tools such as the control of demand, facilitated by a 'smart' grid and large-scale grid interconnection with the rest of Europe, which will allow peaks and troughs in generation to be traded between countries. In addition it should be noted that as this conventional 'reserve margin' will only be used at peak demand it will still mean a reduction in greenhouse gas emissions and the avoidance of an over reliance on increasingly expensive fossil fuel imports.

As more and more wind is added to the system the amount of time existing fossil fuel plants need to operate will diminish – reducing both operating costs and carbon emissions. Over time the carbon savings will be significant in order to meet the Government's Committee on Climate Change's plan to reduce carbon intensity in electricity generation from over 500g/kWh today to less than 100g/kWh by 2030.

Background section

Offshore wind speeds are generally higher than onshore wind speeds and this is the main reason why the development of offshore wind is attractive. The higher energy yields offset the higher construction costs. The higher energy yields work towards offsetting the higher construction costs.

In the European Union, many member states could source a significant proportion of their electricity requirements from offshore wind and the total resource has been

described as "truly enormous"⁴. 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. There is also interest in offshore wind in China, Japan, the United States and elsewhere.

The technology

Offshore wind turbines are based on the same technology as their onshore counterparts and their expected lifespan is the same, approximately 20 years. Currently the main difference is their size. A typical offshore turbine has a tower height of 80 or 90 metres (m) and a height to the uppermost blade tip of about 130 m. Turbines currently being used offshore are rated at 3 MW, 3.6 MW and 5 MW. Larger turbines are currently in development, with a prototype 10MW turbine being developed in the UK at Blyth.

The Government's renewable energy targets

The Government has agreed to two binding targets that drive the expansion of renewable energy. The first target is an agreement with the EU to produce 15% of all its energy from renewable sources by 2020 and this includes energy for heat, transportation and electricity. The Government published a Renewable Energy Strategy⁵ last year which outlined how this could be produced, and will publish a further National Action Plan this June. Wind energy is the most commercially mature renewable energy technology and would be required to provide the largest single portion of this target – BWEA analysis suggests that this will require in the region of 34GW of installed wind, with roughly two-thirds coming from offshore.

The second UK target is an 80% reduction from 1990 levels of carbon emissions by 2050. This large challenge will require a transformation to a low carbon economy. Offshore wind development is well positioned to make a significant contribution to these targets.

The development of offshore wind to date

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 nine years and there are now (Jan 2010) nine operational projects totalling 688 megawatts (MW). Another 13 projects with a total capacity of 4598 MW have consents and a further 2200 MW are being developed for entry into the planning system. These projects are in addition to those created by the Round 3 announcement.

Offshore wind farm developments require a lease from the Crown Estate, who own the seabed out to the 12 nautical mile (nm) territorial limit around the UK and manage the seabed beyond 12 nm. The lease term of projects is between 22 and 50 years and the lease holder pays a rent.

The Crown Estate has decided to issue the rights to these leases in a series of commercial tender rounds. The first and second rounds have been issued and are being developed. The third round is about to commence.

Round 1

The first phase of the UK's offshore wind programme was launched in December 2000. Successful Round 1 applicants were announced in April 2001, with leases awarded for 18 sites at 13 locations, some of them multiple developments totalling over 1GW of capacity. 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 1

Name	Location	MW Capacity	Developer/Turbines
North Hoyle	North Wales	60	npower renewables
Scroby Sands	East of England	60	E.ON UK Renewables
Kentish Flats	Thames Estuary	90	Vattenfall
Barrow	North West Eng	90	Centrica/DONG Energy
Gunfleet Sands I	Thames Estuary	108	DONG Energy
Lynn/Inner Dowsing	Greater Wash	194.4	Centrica
Rhyl Flats	North Wales	90	npower renewables
Burbo Bank	North West Eng	90	DONG Energy
Robin Rigg	North West Eng	180	E.ON UK Renewables
Teesside	Yorkshire & Humber	90	EDF
Ormonde	North West	150	Vattenfall

Round 2

Between November 2002 and February 2003, the Government held a Strategic Environmental Assessment (SEA) on the development of a programme for offshore wind. The Crown Estate and Government then identified three key areas as appropriate for development: the Thames Estuary, the Greater Wash and the North West. Round 2 sites are larger than Round 1 sites and some large schemes have been awarded sites – two are 1 GW or more in capacity and as big as conventional power stations.

In December 2003 the final results were announced, with the rights to develop 15 sites totalling 7.2 GW awarded to 10 companies or consortia. Projects in Round 2 have mostly completed the consenting process, though some are still to be determined. The 1,000 MW London Array development submitted its Environment Statement in June 2005. The current status of all the projects may be found on the BWEA website.

Round 2

Name	Location	MW capacity	Developer
Docking Shoal	Greater Wash	500	Centrica
Race Bank	Greater Wash	620	Centrica
Sheringham Shoal	East of England	315	StatoilHydro/Statkraft
Humber Gateway	Yorkshire & Humber	300	E.on
Triton Knoll	Greater Wash	1,200	npower renewables
Lincs	Greater Wash	270	Centrica
Westermost Rough	Greater Wash	240	DONG Energy
Dudgeon	Greater Wash	560	Warwick Energy
Greater Gabbard	Thames Estuary	504	SSE Airtricity/Fluor
Gunfleet Sands II	Thames Estuary	64.8	DONG Energy
London Array 1	Thames Estuary	630	DONG Energy / E.ON UK Renewables/Masdar
London Array II	Thames Estuary	370	DONG Energy / E.ON UK Renewables/Masdar
Thanet	Thames Estuary	300	Vattenfall
Walney I	North West	183.6	DONG Energy
Walney II	North West	183.6	DONG Energy
Gwynt y Mor	North Wales	750	npower renewables
West of Duddon Sands	North West	500	ScottishPower / DONG Energy

Rounds 1 and 2 extensions

In July 2009, the Crown Estate offered Round 1 and 2 offshore windfarm operators the opportunity to apply for area extensions. The results should be announced in the first half of 2010 and the resulting projects will be subject to the normal consenting process. This could provide an additional 1-2GW of capacity.

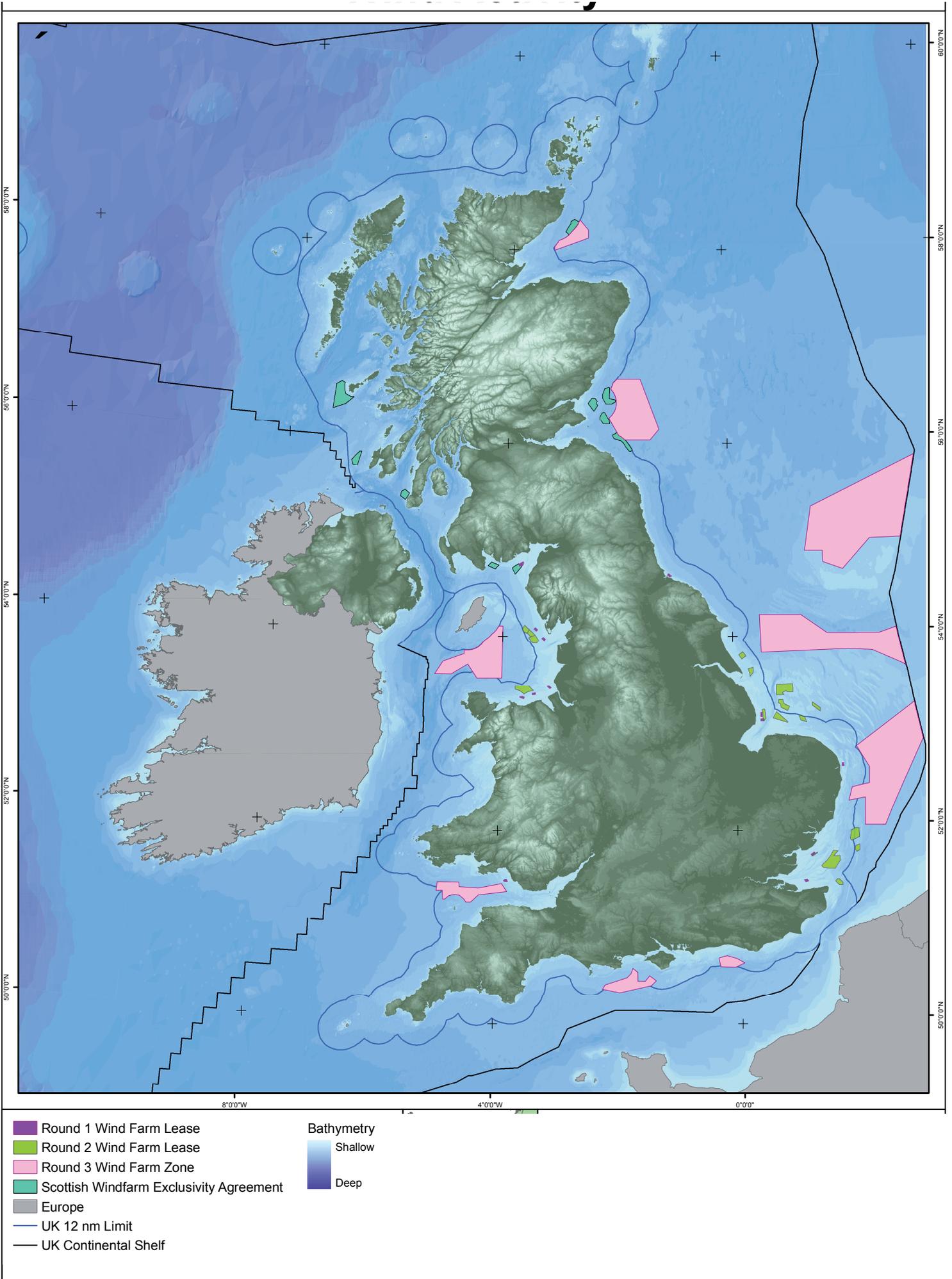
Scottish Offshore Wind

In May 2008, The Crown Estate requested initial expressions of interest from companies wishing to develop windfarms within Scottish territorial waters. The Scottish Government is carrying out a Strategic Environmental Assessment (SEA) for offshore wind to ensure this resource is developed strategically. In February 2009, The Crown Estate offered exclusivity agreements for 10 sites for offshore windfarms within Scottish territorial waters. In total the sites have the potential to generate more than 6 GW of offshore wind power. More information is available on the BWEA web site.

Scottish Territorial Waters

Wind farm	MW capacity	Developer
Argyll Array	1500	Scottish Power Renewables
Bell Rock	700	Airtricity & Flour
Beatrice	920	Airtricity & SeaEnergy
Forth Array	415	Fred Olsen Renewables
Inch Cape	905	Npower & SeaEnergy
Islay	680	Airtricity
Kintyre	378	Airtricity
Neart na Gaoithe	360	Mainstream
Solway Firth	300	E.ON
Wigtown Bay	280	DONG Energy

Wind Activity



Map courtesy Crown Estate

BWEA



Delivering the UK's wind, wave and tidal energy

BWEA
Greencoat House
Francis Street
London SW1P 1DH
United Kingdom

Tel: +44 (0)20 7901 3000

Fax: +44 (0)20 7901 3001

www.bwea.com