



Offshore wind operational report 2013



Introduction

The UK is the world leader in offshore wind power with more capacity installed than any other nation. There are currently 3.6 gigawatts (GW) of operational wind capacity* around the coastlines of England, Scotland and Wales and that figure is growing rapidly.



The total offshore wind farm output of green electricity for 2012 was 7.5 terawatt hours (TWh), which we estimate was enough to supply six per cent of all the homes in the UK. This figure confirms that offshore wind is already playing an important role in the development of a low carbon economy in Britain.

At The Crown Estate, we are taking a proactive approach to help the industry realise its full potential, working with

statutory and non-statutory bodies, regulators, trade associations, the UK government and devolved administrations.

This publication seeks to present previously published and newly available information in a combined format, providing clarity as to what has already been achieved in the successful delivery of offshore wind and to put this into context from both a regional and a national perspective.

*Including operational capacity at Lincs and Teesside

The UK's 2020 renewable energy target

Offshore wind will play a crucial role in the UK government's commitment for renewable energy to contribute 15 per cent of our energy generation mix by 2020.



The government's Renewables Roadmap, most recently updated in December 2012 (see QR code left), sets out the potential for offshore wind to reach 18GW by the end of the decade if the overall cost of providing that energy comes down.



We are working with the industry and government in order to help bring about a reduction in the lifetime cost of offshore wind energy to around £100 per megawatt hour by 2020. Our research has shown this is an achievable goal (Offshore Wind Cost Reduction Pathways Study — see QR code left), but only if all parts of the industry play their role and work closely together to achieve best practice, particularly in the key risk areas of design, installation, and operations and maintenance.

We are also eagerly anticipating the timely conclusion of the government's Electricity Market Reform process which will establish a new support mechanism for low carbon energy generation technologies. Once complete, offshore wind developers seeking to make major investments in the UK's renewable energy sector will have greater long term certainty about how the market will operate.

Health & Safety

A safe and healthy workforce is the number one priority for employers. As a responsible landlord, we also wish to be assured that the development, construction and operational phases of all projects forming the UK's offshore wind sector operate with an exemplary track record in this area.

We were delighted when, last year, senior representatives from nine of the world's largest renewable energy developers joined forces with the Energy Institute to create the G9 Offshore Wind Health and Safety Association. The vision of G9 is to create an offshore wind industry that is seen to deliver world class health and safety performance across all of its activities. Its membership includes representatives from Centrica Renewable Energy, DONG Energy, E.ON UK, RWE npower renewables, ScottishPower Renewables, SSE Renewables, Statkraft, Statoil and Vattenfall.

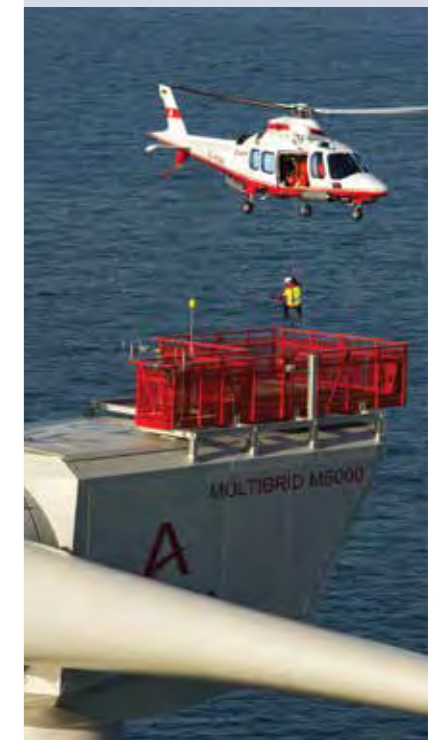


Image courtesy of Areva

Employment

The burgeoning offshore wind power sector is creating a growing number of jobs in the UK, from manufacturing to highly skilled engineering positions, environmental and other consultants, lawyers, surveyors and more.



RenewableUK has estimated that 4,000 people are currently directly employed in the sector. One quarter of these roles help to operate and maintain the 20 existing completed wind farms from 13 ports and shore bases spread around the UK, from Workington in the North West of England to Ramsgate in the South East. These bases have brought welcome permanent job opportunities and, with associated supply chain needs, helped stimulate local economies.

Significantly, the number of people directly employed on offshore wind projects increased by 45 per cent last year, partly as a result of the increase in operations and maintenance activity alongside the higher profile new construction projects.

UK offshore wind farm status: May 2013

Offshore Wind Farm	Capacity (MW)	Status
Blyth (demonstration)	4	Fully Operational
Barrow	90	Fully Operational
Burbo Bank	90	Fully Operational
Greater Gabbard	504	Fully Operational
Gunfleet Sands	108	Fully Operational
Gunfleet II	64	Fully Operational
Inner Dowsing	97	Fully Operational
Kentish Flats	90	Fully Operational
Lynn	97	Fully Operational
North Hoyle	60	Fully Operational
Ormonde	150	Fully Operational
Rhyl Flats	90	Fully Operational
Robin Rigg (W) OERL	90	Fully Operational
Robin Rigg (E) SOL	90	Fully Operational
Scroby Sands	60	Fully Operational
Sheringham Shoal	317	Fully Operational
Thanet	300	Fully Operational
Walney 1	184	Fully Operational
Walney 2	184	Fully Operational
London Array 1	630	Fully Operational
Total fully operational	3,299	
Teesside	62	Under Construction
Lincs	270	Under Construction
Gwynt y Môr	576	Under Construction
West of Duddon Sands	389	Under Construction
Total in construction/partial operation	1,297	
Westermost Rough	210	Final investment decision (FID) taken
Humber Gateway	219	Final investment decision (FID) taken
Total contracted, construction to commence	429	
Kentish Flats 2 extension	51	Post Consent/Pre FID
Race Bank	up to 580	Post Consent/Pre FID
Dudgeon	up to 560	Post Consent/Pre FID
London Array 2	240	Conditional Consent/Pre FID
Greater Gabbard extension (Gallopier)	504	Post Consent/Pre FID
Total consented not yet reached FID	1,935	

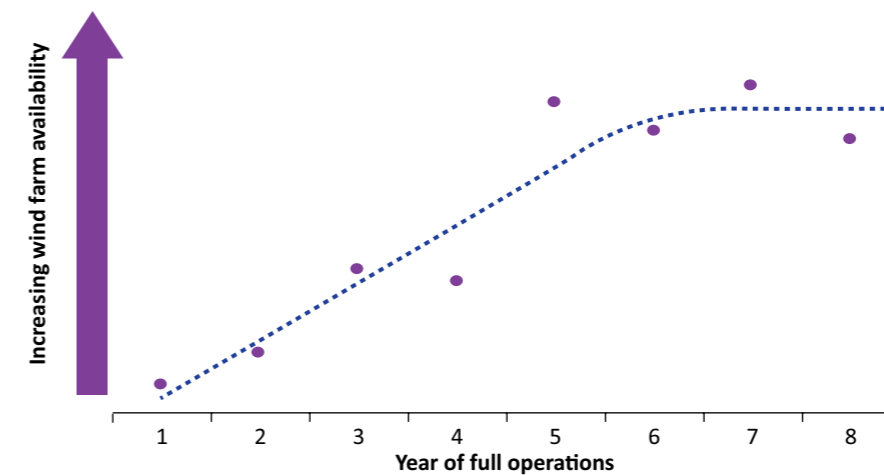
Key metrics

Projects Status	Total No. Sites	Total MW
Fully operational	20	3,299
Total in construction or partial operation	4	1,297
Total contracted, construction to commence	2	429
Total consented not yet reached FID	5	1,935
GRAND TOTAL	31	6,960

Growth in operations

An analysis of available data suggests a general improvement in wind farm availability once post installation issues have been resolved. Availability has generally been seen to increase during the first four years of operation and to level out thereafter. Whilst availability remains an important measure, site operators are increasingly focussed on overall production. Operation and maintenance strategies are evolving with greater emphasis on preventative maintenance in order to ensure greater control over when turbines are taken off line and reduce the likelihood of unplanned interventions.

Operational output improvement



Since December 2000 when the first wind turbines were commissioned off the UK coast at Blyth, 1,065 offshore wind turbines have been erected. To put this achievement in context, we estimate that if all of the blades installed on offshore turbines in the UK were laid end to end they would stretch out to 195 kilometres.

steel mono-pile foundations. However, 32 steel jacket foundations have been successfully deployed in deeper water (Beatrice demonstrator project in the Moray Firth and Ormonde in the east Irish Sea) and other technologies are being demonstrated as part of the Carbon Trust's Offshore Wind Accelerator Programme (see QR code right)

Largely installed in relatively shallow water below 35m, 1,033 of these turbines sit on

In addition, 15 offshore substations have been installed and are fully operational.



*Includes all 75 turbines at Lincs and 19 of 27 at Teesside

15
Offshore substations installed

1065
Offshore wind turbines installed*

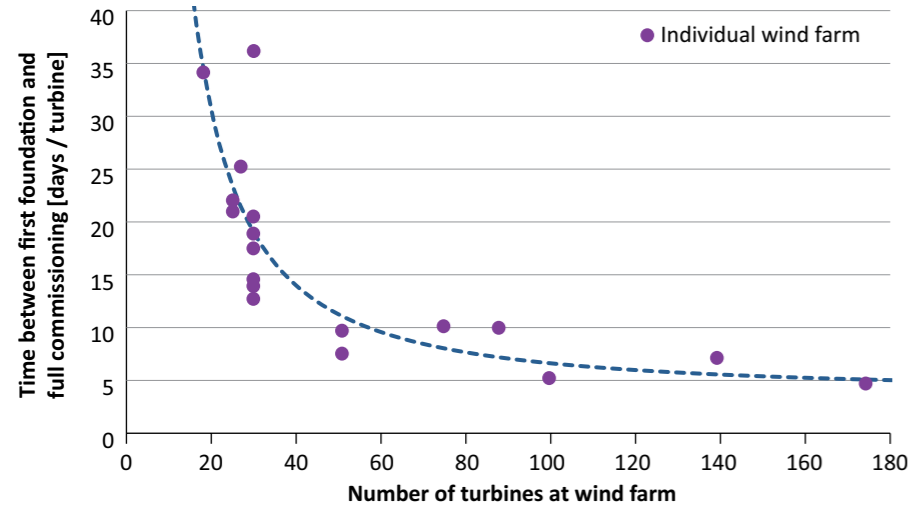
Total length of all blades on constructed turbines
195 km
Approximately the distance between London and Cardiff



Reducing construction times

As the industry matures, the time required to construct each offshore wind turbine has decreased. Installation times over the past 10 years have dropped from an average of 20 to 30 days per turbine to just 5 to 10 days. Construction times have decreased as developers and their supply chains gain experience and learn lessons from previous projects.

Size of project vs. construction time



Construction teams are also demonstrating that larger projects can deliver economies of scale leading to a reduction in installation times. As the average project capacity increases overall construction time is shrinking. This is also influenced by improved technology and installation techniques, bigger vessels and improved knowledge about site characteristics.

The oil and gas industry has demonstrated that the sharing of knowledge and experience, particularly during the operational phase, can help owners compare performance and lead to a range of cost, time and other savings. This includes a reduction in health and safety risk as a consequence of fewer personnel transfers. With industry support we have established the SPARTA project, in conjunction with DNV-KEMA, to review benchmarking options with a view to wider discussion.



Image courtesy of SeaEnergy plc

Pipeline

Offshore wind energy has expanded remarkably over the past 8 years with an annual growth rate in generated electricity of 54 per cent since 2004, when the construction of North Hoyle wind farm was completed in Liverpool Bay.

Last year the industry installed more new offshore wind power capacity than ever before, with over 1.3GW coming fully online. Completed projects comprised SSE Renewables and RWE npower renewables' Greater Gabbard wind farm, DONG Energy and SSE's Walney 2 project, Vattenfall's Ormonde wind farm and Statoil and Statkraft's Sheringham Shoal wind farm.

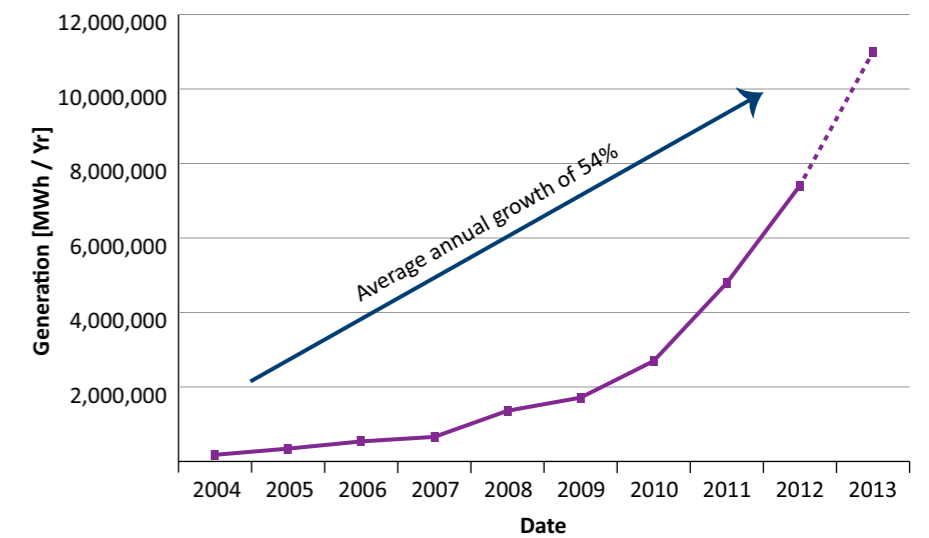
The sector also hit a number of major milestones last year, including delivering first power at Centrica Renewable Energy's 270MW Lincs project in the Greater Wash.

Earlier this year, DONG Energy successfully completed the installation and commissioning of two Siemens 6 megawatt (MW) direct drive demonstration machines adjacent to the Gunfleet Sands site it already operates off the east Essex coast.

RWE npower renewables and Siemens also began offshore construction of the 160-turbine Gwynt y Môr wind farm off the coast of North Wales which, once complete, will generate sufficient energy to power around 400,000 homes.

This year, we anticipate almost 1GW of capacity being added to the grid including London Array, the world's largest offshore wind farm in the Thames Estuary with 630MW of capacity, and Centrica Renewable Energy's 270MW Lincs project near the coast of Skegness.

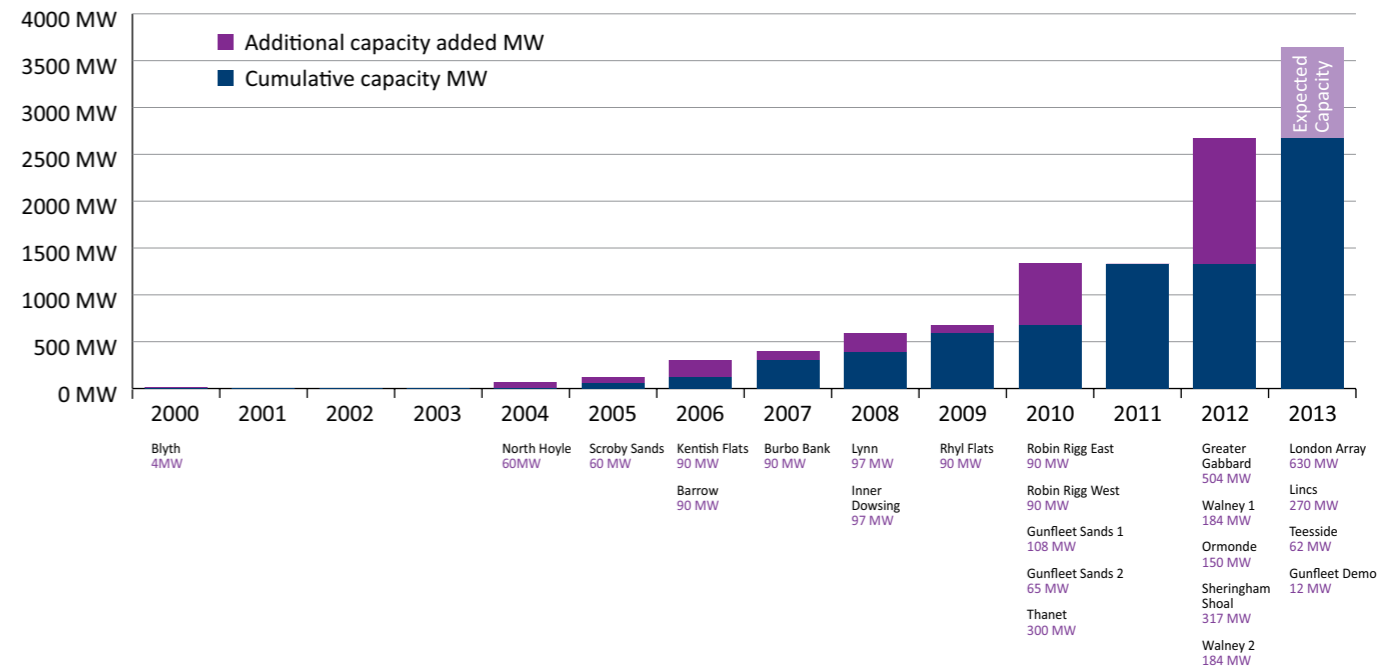
UK offshore wind generation



First power is also expected at RWE npower renewables' Gwynt y Môr site off the north Wales coast, while offshore work is starting at DONG Energy and ScottishPower Renewables' 389MW West of Duddon Sands project, and E.ON UK's 219MW Humber Gateway site.

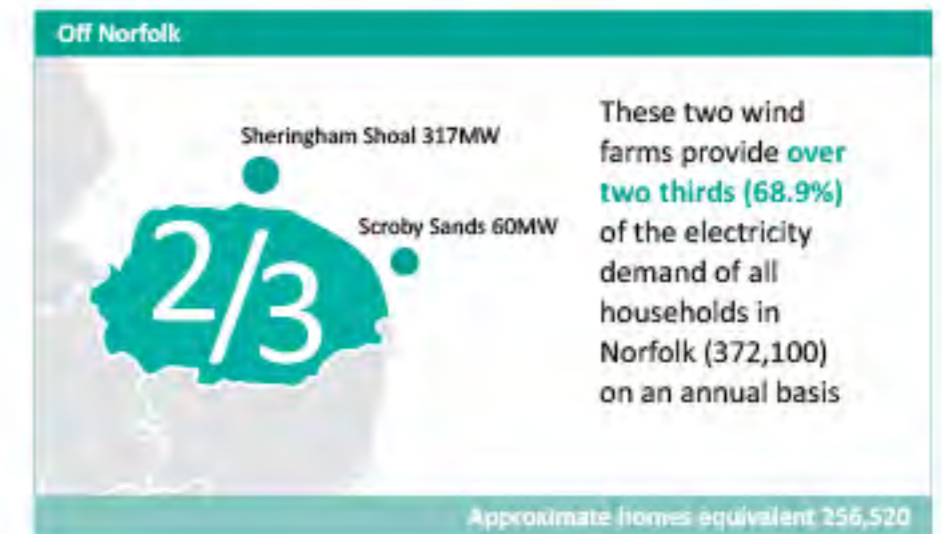
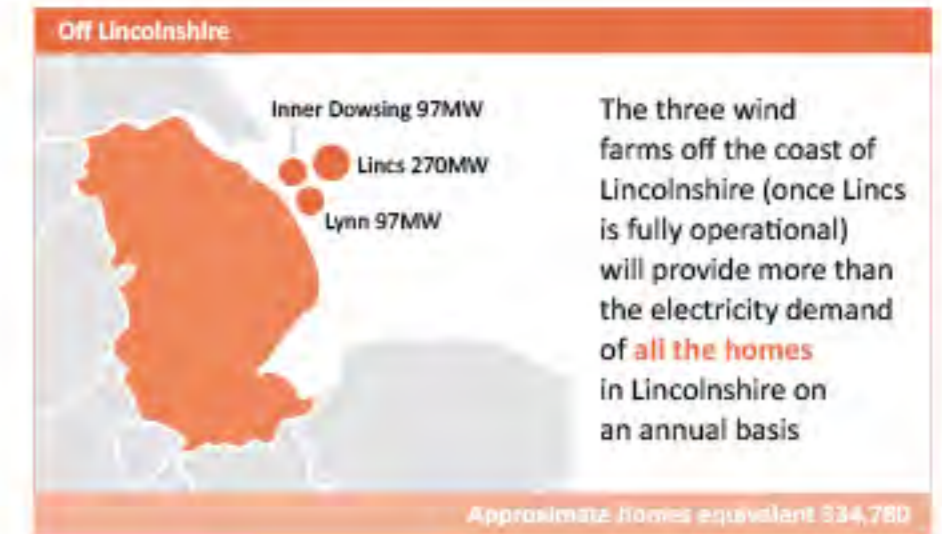
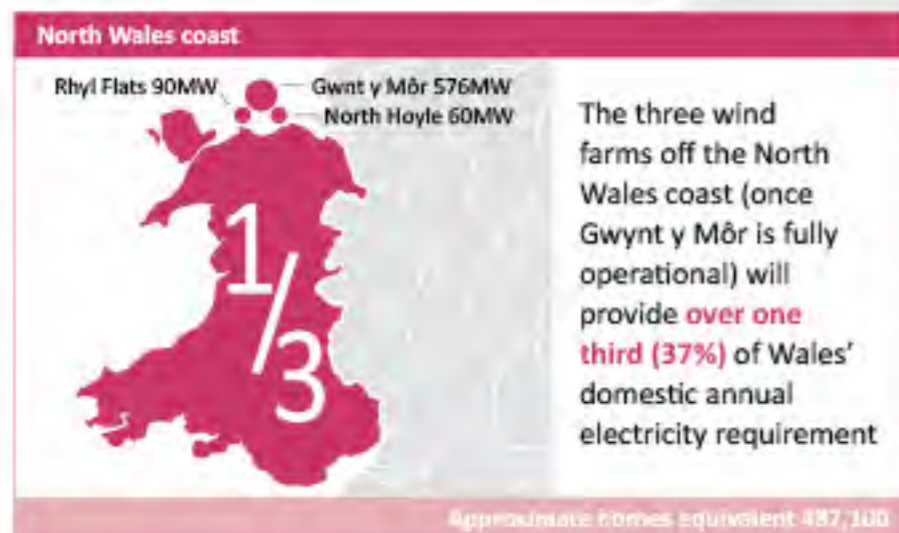
There are a further six offshore wind farms which have received planning permission but which have either to make the final decision to invest or to begin construction. In all, they have the capacity to add a further 1.7GW to the grid.

Offshore wind farm sites achieving full works completion by calendar year



The growing importance of offshore wind

The total offshore wind farm output for 2012 was 7.5 TWh, enough to supply the electricity requirements for around 1.55m homes in the UK.



Sustainability

As the number of low carbon energy projects continues to grow, so will the amount of greenhouse gas emissions that can be avoided.

We estimate that almost five million tonnes of carbon dioxide equivalent emissions were avoided in 2012 through low carbon energy projects across the crown estate portfolio as an alternative to fossil fuel generation, the majority directly as a consequence of operational offshore wind farms.

Offshore wind projects help boost the economy as well as protect the environment. For example, Vattenfall's

Ormonde wind farm near Barrow-in-Furness employed 835 people during its three-year construction period and 40 long-term roles have now been secured for operations and maintenance work.

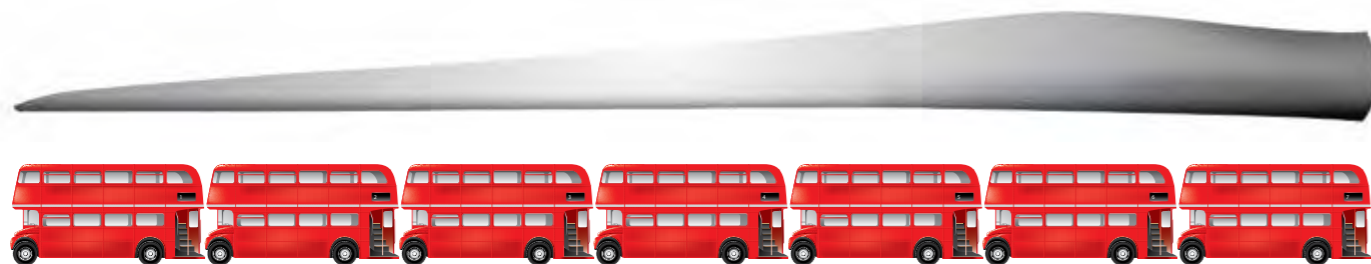
Ormonde's green energy generation each year avoids roughly 429,000 tonnes of carbon dioxide, 5,000 tonnes of sulphur dioxide and 1,500 tonnes of nitrogen oxide emissions being released into the atmosphere.

For more information about offshore wind in the UK please go to:

- www.thecrownestate.co.uk/energy-infrastructure/offshore-wind-energy
- www.renewableuk.com
- www.scottishrenewables.com
- www.gov.uk/government/organisations/department-of-energy-climate-change

A FINAL THOUGHT:

7 X London buses – the length of a single current generation (60m) offshore wind turbine blade.



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