



HM Government

Industrial Strategy: government and industry in partnership



Offshore Wind Industrial Strategy Business and Government Action

August 2013

Contents

Foreword from Government	2
Foreword from the Offshore Wind Industry Council Chair	4
Our Vision for the UK Offshore Wind Industry	5
Offshore wind UK: an industrial opportunity	6
Government and industry actions	11
1. Providing market confidence and demand visibility	14
2. Building a competitive supply chain	20
3. Supporting innovation	36
4. Finance	44
5. Building a highly skilled workforce	49
Summary of actions	55
Measuring success	60
Annex A: Legislative framework for renewable energy	61
Annex B: Summary of key supply chain elements	63
Annex C: SWOT analysis for offshore wind	71
Glossary of terms	72

Foreword from Government

The UK has done more than any other country to support the development of a sustainable and ambitious offshore wind industry but we recognise we have to work hard to keep that position and to reap the rewards. We are now putting in place the framework needed to maintain this position through Electricity Market Reform, which will offer industry guaranteed price support lasting into the 2030s and help provide the certainty needed to underpin long term investment.

We recognise the importance of getting this right. The strategy brings together government and industry to work in partnership to develop the UK's offshore wind industry and provide the tools necessary to support large scale investment in the UK supply chain, raise awareness of the commercial opportunities in the UK and overseas and deliver the innovation and competition needed to bring down costs for consumers.

As part of our new industrial policy, we want to see UK-based businesses grow to create a centre of engineering excellence that delivers cost reduction for UK projects and exports to overseas markets. To achieve the vision set out in this strategy, we need to grow our manufacturing base to be world-leading in more areas of offshore wind supply and to achieve levels of UK content in our offshore wind farms which are similar to those achieved by our North Sea oil and gas industry where more than 70% of capital expenditure is through UK-based suppliers.

To support this, the Manufacturing Advisory Service will deliver the GROW: Offshore Wind service, with £20m funding from the Regional Growth Fund, to enable manufacturers to take advantage of the rapidly growing offshore wind market. We are creating the Offshore Wind Investment Organisation to significantly increase the levels of inward investment to the UK in the offshore wind supply chain. And we are supporting the new Offshore Renewable Energy Catapult to drive innovation, with £46m of funding for a 5 year business plan, enabling innovative companies to commercialise their products which will bring down costs for consumers.

We will only achieve our ambitions through clear commitment and leadership from the partnership between Government and Industry created by the newly formed Offshore Wind Industry Council. And the Coalition Government will play its part by committing to achieving the ambitions within this strategy to provide the catalyst for change.



A stylized, handwritten signature in black ink, consisting of a large, sweeping 'V' and 'C'.

**Rt Hon
Dr Vince Cable MP**

Secretary of State for
Business, Innovation
and Skills



A handwritten signature in black ink that reads 'Edward Davey' in a cursive style.

**Rt Hon Edward Davey
MP**

Secretary of State for
Energy and Climate
Change



A handwritten signature in black ink that reads 'Michael Fallon' in a cursive style.

**Rt Hon Michael Fallon
MP**

Minister of State for
Business and Enterprise
and Minister of State
for Energy

Foreword from the Offshore Wind Industry Council Chair

Offshore wind power represents a unique opportunity for the UK to support thousands of highly skilled jobs, increase energy security and vastly reduce carbon emissions. The UK is currently leading the world in offshore wind development, and maintaining this position will be key to unlocking all of the potential positive benefits, particularly social, economic and environmental. The Offshore Wind Industrial Strategy is an important development that will act as a blueprint to guide both the industry and Government in helping the UK to achieve this.

There are of course challenges to overcome, and it is vital the industry and the Government can work together in co-operation to ensure they are positively addressed. Much work has been undertaken by developers and the wider supply chain to help drive down the costs of offshore wind, and strategic support from Government and other agencies will help to reduce costs even further.

The industry has been encouraged by Government support thus far and by the positive intentions to continue. This commitment is required to give the industry the confidence to invest billions of pounds to develop projects, which will directly support the creation of jobs and provide the associated benefits.

The offshore wind sector has already encouraged investors from all over the world to the UK, and as we prepare to develop larger projects and upgrade existing infrastructure, we must continue to be viewed as an attractive destination for this investment in a competitive global marketplace.



A handwritten signature in black ink, consisting of the letters 'KSA' in a stylized, cursive font. A long, thin arrow-like stroke extends from the top of the 'A' towards the right.

Keith Anderson

Chief Corporate Officer,
ScottishPower

Our Vision for the UK Offshore Wind Industry

Industry and Government work together to build a competitive and innovative UK supply chain that delivers and sustains jobs, exports and economic benefits for the UK, supporting offshore wind as a core and cost-effective part of the UK's long-term electricity mix:

The vision is to deliver:

- economic growth creating tens of thousands of long term UK jobs
- a clear and sustainable project pipeline
- major manufacturing facilities in the UK
- the development of a competitive UK-based supply chain
- a technology cost-competitive with other low carbon technologies



V164 Hub at Isle Of Wight

Offshore wind UK: an industrial opportunity

Offshore wind is an ideal technology for the UK where our shallow seas and strong winds make it an important national asset. Since the first UK offshore wind farm was built over a decade ago, offshore wind has evolved to become a large-scale commercial renewable technology with an important role to play in the Government's long term plan for a balanced low carbon electricity generation portfolio to help meet our 2050 carbon targets and enhance security of supply. Together with long-term price stability and a huge development pipeline, this has helped make the UK one of the most attractive locations in the world to invest in the offshore wind market.¹

The UK has an unparalleled opportunity to develop offshore wind in the decades to come. The offshore wind sector has the potential to become one of strategic economic importance to the UK, supporting a thriving UK supply chain and exporting expertise and technology all over the world. In 2020/21, under a strong growth scenario, the sector could deliver in the order of £7bn Gross Value Added (GVA) to the UK economy (excluding exports) and support over 30,000 full time equivalent UK jobs.² Longer term, the outlook is for further strong growth in the sector. Independent analysis forecasts 28GW of installed offshore wind capacity across the EU by 2020 and 55GW across the EU by 2030.³ By 2030, it has been estimated that offshore wind could increase net exports by £7-18bn.⁴

The Government is committed to providing unprecedented levels of price support to low carbon generation, through the Renewables Obligation and then through Contracts for Difference (CfDs). For offshore wind to benefit fully from Government and consumer support, it is vital that this results in investment in the UK supply chain and delivers economic growth and long term jobs in the UK. Increased supply chain capacity will in turn help to reduce the costs to consumers through greater competition in the market.

- 1 Ernst & Young (May 2013), *Renewable Energy Country Attractiveness Indices*
[http://www.ey.com/Publication/vwLUAssets/Renewable_energy_country_attractiveness_indices_-_Issue_37/\\$FILE/RECAI-May-2013.pdf](http://www.ey.com/Publication/vwLUAssets/Renewable_energy_country_attractiveness_indices_-_Issue_37/$FILE/RECAI-May-2013.pdf)
- 2 BVG Associates estimate. This is based on a scenario of 16GW installed by end 2020, with 50% UK content in capital expenditure and 85% content in operational expenditure. Derived from The Crown Estate (June 2012), *Offshore wind cost reduction pathways, Technology work stream*, Renewable Advisory Board (2010), *Value breakdown for the offshore wind sector* and Cebr Report (June 2012), *Macroeconomics benefits of investment in offshore wind*
- 3 Bloomberg New Energy Finance
- 4 Cebr Report (June 2012), *Macroeconomics benefits of investment in offshore wind*

The purpose of this strategy is to support the sector in delivering this economic potential for the UK by promoting innovation, investment and economic growth in the UK supply chain. Government and industry – both developers and the supply chain – will work together through the newly formed Offshore Wind Industry Council to drive success and help ensure that the UK supply chain is in a strong position to take advantage of future opportunities.

The measures in this strategy aim to open up opportunities to the UK supply chain and increase its competitiveness in order to support the twin objectives of reducing the cost of energy and maximising economic benefit. UK supply needs to deliver cost competitive, high quality product, with the highest possible standards in health and safety, in order to compete globally and create a sustainable UK-based supply chain.

Success will be measured by significant long term growth in manufacturing and other facilities in the UK at the top tier of the supply chain – turbines, foundations, cables and substations – as well as in the deeper supply chain and in installation, operations and maintenance, and other services.

In parallel, the continued work of the Offshore Wind Programme Board in implementing the recommendations of the *Cost Reduction Task Force Report* will be critical to driving down the cost of offshore wind, thereby reducing costs to consumers.⁵

A changed energy landscape – comprehensive support and a major new investment programme

As of July 2013, the UK has more offshore wind turbines operating than the rest of the world: more than 1000 turbines with a combined capacity of about 3.6 GW, as well as the largest wind farm, the largest construction project, the largest planning application and the largest development pipeline in the world. Energy generated from offshore wind rose by 46% from 5.1TWh in 2011 to 7.5TWh in 2012, and in both years load factors of over 35% were achieved.⁶ In the first quarter of 2013, offshore wind energy production increased more than any other type of renewable energy technology, to 2.5TWh, up from 1.5TWh in the first quarter of 2012.

By 2020, the UK will require billions of pounds of investment in new low carbon electricity generation plant to replace old generation plants which are reaching the end of their lifetimes. Investment in low carbon electricity generation, such as Renewables, Nuclear and Carbon Capture and Storage, is also essential to meet

5 The Offshore Wind Cost Reduction Taskforce (2012), *Cost Reduction Task Force Report* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66776/5584-offshore-wind-cost-reduction-task-force-report.pdf

6 Digest of Energy Statistics (March 2013), page 46 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/170736/energy_trends_march_2013.PDF

growing demand for electricity while achieving legally binding greenhouse gas emission targets.

The Climate Change Act 2008 sets an overarching statutory 2050 carbon target to cut emissions by at least 80% across the whole economy, and this is likely to require the electricity sector to be virtually decarbonised in the long term. Furthermore, the Government has brought forward new clauses in the Energy Bill currently before Parliament which enables the Government to set a statutory 2030 decarbonisation target range for the electricity sector in 2016, once the level of the Fifth Carbon Budget, which covers the corresponding period (2028-32), has been set in law.

The level of investment needed in low carbon electricity generation has driven Electricity Market Reform, which is the biggest change to the UK electricity market since it was privatised in 1990, and our aim is for the Energy Bill to secure Royal Assent by the end of 2013 (depending on Parliamentary timings). The UK is determined to design an electricity market that makes low carbon generation, with its high up-front capital costs, cost-effective for industry, taxpayers and consumers.

The announcement in November 2012 that the Government had reached agreement on the Levy Control Framework (the total subsidy available for low carbon technologies) to 2020/21 is a huge step forward that has made a significant impact in the sector. The Levy Control Framework will be set at £7.6bn total in 2020/21 (2011/12 prices). This will enable the UK to meet our 2020 renewable and low carbon goals.

The new support mechanism for low carbon generation – Contracts for Difference (CfDs) – will put low carbon generation at the core of the UK market structure. It will help to drive down the cost of capital as projects awarded a CfD will have price certainty for 15 years giving business a predictable income stream. In June 2013, Government announced the draft CfD strike prices for renewables technologies, including offshore wind, through to 2018/19, which will help achieve the Government's objectives on renewables.

These policies mean the UK is the first country in the world to give funding clarity through to 2021, visibility of prices to 2018/19 and price certainty to projects awarded CfD contracts, as well as a legally binding emissions target. This will enable the offshore wind industry to contribute significantly to the UK's 2020 renewable energy target and put it in a strong position going into the next decade and beyond. Annex A describes the legislative framework for renewable energy.

A partnership to deliver

This strategy sets out how our vision will be achieved, with the offshore wind supply chain, developers and Government working in partnership to deliver the right investment signals and framework to build a sustainable offshore wind industry, supporting investment and long term jobs in the UK. It identifies practical measures to develop and grow a competitive UK supply chain. It aims to demonstrate opportunities to UK



Monopile leaving TAG factory

Courtesy of TAG Energy Solutions

companies and encourage the top tier of the supply chain to invest in UK facilities to benefit from a highly skilled workforce and proximity to a huge market. Attracting the top tier suppliers will open up opportunities for the rest of the UK supply chain.

The Offshore Wind Developers Forum (OWDF), made up of developers with interests in Round 3 wind farms in the UK, published a vision in early 2012 for “...The UK to be the centre of offshore wind technology and deployment, with a competitive supply chain in the UK, providing over 50 per cent of the content of offshore wind farm projects.”⁷

The Government will actively support the supply chain to meet the challenges it faces. The Government is contributing £20 million towards the Manufacturing Advisory Service Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind) to provide the tailored support required to develop the wider supply chain and capitalise on the significant growth opportunities in the offshore wind sector. In addition, Government has set aside funding and resource to create the Offshore Wind Investment Organisation, a private sector led body to attract inward investment to the UK. The recently created Offshore Renewable Energy (ORE) Catapult will have a pivotal role in strengthening collaboration in offshore renewable innovation in the UK and funding of £46.1 million has been confirmed to cover its first 5 years of operation. Access to finance is a critical issue and Government, through the Green Investment Bank, the Business Bank and Infrastructure UK, is working to improve access to finance and reduce the cost of capital.

Industry is also playing its part to drive growth and deliver economic benefit in the UK supply chain. Developers are providing detailed information on project pipelines that will enable the supply chain to plan ahead with greater confidence, as well as

⁷ See <http://www.thecrownestate.co.uk/energy-infrastructure/offshore-wind-energy/working-with-us/offshore-wind-developers-forum/>

participating in events such as 'Share Fair' to provide supply chain companies with information about opportunities to bid for contracts. The Offshore Wind Programme Board is exploring contracting models and approaches that will help facilitate new entrants to the market. There are good examples of industry working with the education sector to enable development of the skills needed by the sector.



David Brown Wind's 7MW offshore gearbox under test

Courtesy of David Brown Gear Systems Ltd

Government is committed to working in partnership with the supply chain and developers to support delivery, with dedicated teams in three Departments:

- i. DECC will set the energy policy framework and support for offshore wind;
- ii. BIS will focus on delivering industrial growth including through the Technology Strategy Board, BIS Local and Local Enterprise Partnerships (LEPS), particularly through Centres for Offshore Renewable Engineering (COREs); and
- iii. UKTI will actively promote inward investment in the UK and support UK exports.

In Scotland, Wales and Northern Ireland, the key departments and agencies are working together to drive progress.

The newly formed Offshore Wind Industry Council will oversee delivery of the Offshore Wind Industrial Strategy. The Council will provide leadership and strategic direction to achieve our vision of economic growth creating tens of thousands of long term UK jobs.

Government and industry actions

This strategy sets out a programme of actions, to be delivered by Government and industry, that will build a competitive and innovative UK supply chain. The Offshore Wind Industry Council (OWIC) and Offshore Wind Programme Board (OWPB), together with Government, identified the challenges facing the sector and developed this programme of actions.

The OWIC brings together developers investing in offshore wind projects in the UK, representatives of the UK-based supply chain, the UK Government, The Crown Estate and the Devolved Administrations. It is the leading engagement body between the UK offshore wind industry and Government. Its purpose is to provide a forum for dialogue between the different parts of the industry and to enable the UK offshore wind industry and Government to work together to remove barriers to offshore wind in the UK, reduce costs and build a competitive UK-based industry. As part of its remit, the Council will oversee delivery of the offshore wind industrial strategy, providing leadership and strategic direction.

The OWPB was established following the recommendations in the Offshore Wind Cost Reduction Task Force report.⁸ It brings together representatives from developers and the supply chain, UK and Scottish Government, The Crown Estate and Statutory Nature Conservation Bodies. The OWPB's objective is to implement the Task Force's recommendations to drive cost reduction. The OWPB reports to the OWIC.

This strategy takes account of existing evidence, including the work of the Cost Reduction Task Force, as well as new evidence gathered through a series of discussions with industry and responses to a Call for Views issued specifically for the development of this strategy.⁹

A summary of the UK's current supply chain capability and the strengths, weaknesses, opportunities and threats identified (SWOT analysis) is set out in Annex B and Annex C respectively.

8 The Offshore Wind Cost Reduction Taskforce (2012), *Cost Reduction Task Force Report*

9 <https://www.gov.uk/government/publications/offshore-wind-sector-strategy-call-for-views>

Building on our strengths

The actions described in this strategy will enable the UK to build on its existing competitive strengths which make the UK one of the most attractive locations in the world for offshore wind investment.¹⁰ These strengths include:

- a large wind resource and favourable locations for offshore wind
- a robust regulatory regime, including a legislative framework to support greater use of renewable energy, a solid planning framework and offshore leasing regime
- expertise in installation, operations and maintenance of large offshore infrastructure
- advanced manufacturing and materials capability, where opportunities exist for technology transfer from sectors such as aerospace
- world-leading research and development capability, with excellent research institutes, universities and industry research centres specialising in offshore wind and renewable energy



Fugro Excalibur installing at Thanet

Courtesy of Fugro GeoConsulting Ltd

Tackling the challenges

There are challenges to ensuring that the UK supply chain benefits significantly from future offshore wind deployment and is able to fully capitalise on the opportunities this provides, particularly in the presence of well-established competition in other countries. These challenges include:

- increasing visibility of the pipeline of future projects and the likely size and timing of future market demand, particularly past 2020
- ensuring potential inward investors understand the benefit of locating manufacturing facilities in the UK and attracting tier one equipment suppliers, particularly turbine manufacturers, to set up operations in the UK
- enabling UK supply chain companies to develop the capability to meet the requirements of developers and top tier manufacturers and compete globally on cost and quality on a level playing field

¹⁰ Ernst & Young (May 2013), *Renewable energy country attractiveness indices*

- overcoming barriers to development and demonstration of the next generation of turbines, foundations and components which are needed to drive down costs
- facilitating the waterside infrastructure developments which are needed to cater for offshore wind manufacturing
- addressing the real and perceived risks which increase the cost of financing the offshore wind market
- meeting future increased demand for highly skilled staff

1. Providing market confidence and demand visibility

Both the supply chain and developers have stressed that long term market certainty is critical for investment decisions. Growing confidence relies on developers understanding the price support mechanism under the Electricity Market Reform (EMR) programme, how Contracts for Difference (CfDs) will be allocated and clarity on how to attract investment to enable projects to reach the Final Investment Decision. The supply chain requires confidence that there will be sufficient orders in the long term, particularly if companies need to invest in new or expanded facilities to meet potential demand. This section sets out the Government's plans to ensure that developers have confidence in the price support mechanism under EMR and developers' plans to share more detailed information on project pipelines with the supply chain.

Issue: market confidence

Before developers will commit to investing the huge capital costs to develop their offshore wind projects, they need to ensure that projects are commercially viable. A key element in their decision making will be the level of the 'strike price' for offshore wind and key contract terms under Contracts for Difference (CfDs).

CfDs are a key element of the EMR programme. They will provide efficient and long term support for low carbon generation, reducing risks faced by generators by increasing revenue certainty and through the backing of a long-term contract. Generators will receive revenue from selling their electricity into the market as usual, but will also receive a top-up to a pre-agreed 'strike price'. Conversely, if the market price is higher than the strike price then the generator must pay back the difference, which reduces costs to consumers when electricity prices are high.

Action

Government has brought forward the key announcements on EMR that are intended to allow industry to plan major capital investment in the UK and its supply chain.¹¹

In June 2013, Government published the draft strike prices for renewables technologies, including offshore wind, up to 2018/19. They are being set at a level to achieve the Government's objectives on renewables and low carbon generation, enabling over 30% of Britain's electricity to come from renewable energy sources by 2020. In July 2013, Government published the draft EMR Delivery Plan for consultation.¹² This set out the robust methodology and analysis which provided the

11 DECC (June 2013), *Electricity Market Reform: Delivering UK Investment* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209276/EMR_Spending_Review_Announcement_-_FINAL_PDF.pdf

12 DECC (July 2013), *Consultation on the draft Electricity Market Reform Delivery Plan* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223650/emr_delivery_plan_consultation.pdf

basis for the draft CfD strike prices announced in June 2013. Following the consultation, confirmed strike prices will be published in the final Delivery Plan due in December 2013 (subject to Royal Assent of the Energy Bill). The publication timetable is designed to give developers up to a year's visibility on intended strike prices before they come into force in 2014 and enable final investment decisions to be made, where appropriate, ahead of the full EMR regime going live. Overall support will reduce over time, as reflected by the draft strike prices, to take into account the cost reductions expected as a technology becomes more mature. This will ensure that support is targeted where it helps a technology to become competitive and maximises value for consumers.

Alongside the draft strike prices, Government published the limits on annual spending on low carbon generation as agreed in the Levy Control Framework up to 2020/21, as well as potential 2020 deployment sensitivities for each renewable technology.¹³ For offshore wind, the potential 2020 deployment set out is 8-16GW dependent on a range of factors including industry cost reductions over time. In the draft EMR Delivery Plan, Government also included a forward look to 2030. This provided indicative illustrations of offshore wind deployment through to 2030 under a number of different scenarios. The scenarios are illustrative: the actual deployment levels realised in this period will depend on cost reductions, support levels and other factors. In the high offshore wind scenario, based on central demand and decarbonisation assumptions (100g CO₂/kWh), it is assumed that central offshore wind costs fall to around £95/MWh in the mid-2020s, with support levels falling significantly less quickly than costs. This would have to be a policy decision for the Government of the day. Modelling suggests deployment of roughly 39GW of offshore wind in 2030 would be consistent with those assumptions. If offshore wind costs fall less quickly than this, to around £125/MWh in the mid-2020s, modelling suggests around 18GW offshore wind deployment in 2030.

Under the Final Investment Decision Enabling for Renewables (FID Enabling) programme, Government has set out a framework for applying for Investment Contracts which are an early form of CfD. The purpose of the FID Enabling programme is to avoid a hiatus in investment in low carbon generation during changes to the market under EMR ahead of the implementation of CfDs in the enduring regime. In the second update on FID Enabling, Government has set out the process and evaluation criteria for applicants for an Investment Contract.¹⁴ The evaluation criteria include impact on industry development which focuses on whether the project is likely to support the long term growth and economic viability of industries associated with the generation of electricity from renewable sources. The aim of this criterion is to allocate Investment Contracts in a manner that will help develop a broad, competitive and sustainable supply chain.

13 Potential 2020 deployment sensitivities are dependent on industry cost reductions over time and the figures are not Government forecasts

14 DECC (June 2013), *Final Investment Decision Enabling for Renewables Update 2: Investment Contract Allocation* <https://www.gov.uk/government/publications/increasing-certainty-for-investors-in-renewable-electricity-final-investment-decision-enabling-for-renewables>

The Government will shortly publish further detail on the CfD contract terms and information about how CfDs will be allocated. The Government will engage with interested stakeholders on the detailed drafting of the CfD contract to seek views. Subject to Royal Assent of the Energy Bill, the final contract drafting will be published in December, alongside the final strike prices, and implemented through regulations laid before Parliament in 2014. The EMR programme is on track to be implemented in 2014.

Establishing a sustainable supply chain is key to any energy project's deliverability and is a key part of understanding its social, economic and environmental impacts and benefits, allowing adverse impacts to be minimised (e.g. reducing the carbon footprint of construction) and benefits to be maximised (e.g. creating economic opportunities in the supply chain, supporting SMEs and innovative companies). These issues are particularly important for larger projects. In the context of support mechanisms they are an important consideration to provide assurance around deliverability and a project's contribution to wider objectives.

In order to support sustainable supply chain development and competitiveness, whilst ensuring our proposals maintain value for money, Government is minded to require developers to produce a supply chain plan before they can apply for a CfD, informed by the approach taken in the FID Enabling process. This would require developments above a certain size to produce a supply chain plan which must meet a minimum standard as a condition for eligibility for entering the allocation process for a Contract for Difference. The supply chain plan will be expected to set out how the project and procurement approaches will support sustainable supply chain development, encourage a wider, more diverse supply chain and support innovation and development of skills. Clear guidance will be provided on the information required in the supply chain plan to meet the minimum standard and developments will have the opportunity to resubmit their plan if it does not initially meet the necessary standard. Government will develop the process and criteria over the coming months and will publish details later this year. Government will work with the Offshore Wind Industry Council and key stakeholders to ensure that there is an opportunity for industry views to be taken into account when developing the detailed process.

Issue: demand visibility

The supply chain needs confidence that sufficient offshore wind projects will be constructed to provide a strong-enough pipeline of orders to merit investment. Supply chain investment decisions are dependent on visibility of project development and a clear line of sight on when contracts are likely to go out to tender.

The supply chain has indicated that developers and top tier manufacturers could give more effective signals about project scope and timescales, and that reliable demand signals are needed on an ongoing basis. Without this, it is difficult for the supply chain to invest in new facilities or equipment as the capital cost of new plant is high.

Developers tend to signal to the supply chain on a project by project basis. A low build rate or project by project approach could mean insufficient demand is created to warrant significant investment in UK facilities or overseas manufacturers utilise existing capacity in other countries to meet demand. Conversely, greater visibility of the size and timing of market demand should allow the UK supply chain to plan and be ready to deliver and give confidence to overseas manufacturers to establish facilities in the UK.

Action

To help ensure that the supply chain ‘sees’ the scale of the UK opportunity, developers will provide a project-by-project pipeline of demand showing:

- i. key project milestones, i.e. expected dates for consent, grid connection and Final Investment Decision (FID);
- ii. invitations to tender and contracting decision points

This information will be provided for projects expected to achieve Final Investment Decision in the next five years. Similar information, but with less detail on timings, will be provided for later projects. At the RenewableUK Offshore Wind Conference in June 2013, RenewableUK published *Offshore Wind Project Timelines 2013* using data provided by all developers.¹⁵ This information will be updated at least annually.

In addition, the MAS Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind), using the capability of the Manufacturing Advisory Service (MAS) and RenewableUK, will provide an assessment of future markets for individual elements of an offshore wind farm, including contracting decision points relevant to companies deeper in the supply chain. The GROW: Offshore Wind programme is described in the section on *Building a competitive UK supply chain*.

In Scotland, the recommendations set out in the Offshore Wind Route Map and the work of the Offshore Wind Industry Group (OWIG) will build on existing project pipelines to give greater visibility to the supply chain on development timings and identify any potential bottlenecks.

Underpinning the *Offshore Wind Project Timelines* report, developers will also adopt the successful practice of ‘Share Fairs’ from the oil and gas sector to further enhance the visibility to the supply chain. RenewableUK ran the first ‘Share Fair’ at its annual Offshore Wind Conference in June 2013. The Share Fairs will focus on near term projects and provide the opportunity for the supply chain to hear directly from developers on their procurement strategies, timescales and any pre-qualification requirements as well as providing opportunities for 1-to-1 sessions with the procurement teams. The Share Fairs will complement the supply chain events and supplier days run by individual developers.

¹⁵ <http://www.renewableuk.com/en/publications/index.cfm/offshore-wind-Project-timelines-2013>

Issue: improving public perception

While public perception of offshore wind is generally positive, it receives mixed press coverage and can be negatively impacted by anti-onshore wind campaigning activity. This strategy does not seek to address perception in terms of consenting of projects but there is scope to do more to improve the wider public's view of the sector as valuable to the UK economy, providing significant long term employment opportunities.



Worthing Public Exhibition during the Section 47 Community Consultation

Courtesy of E.ON Climate & Renewables UK

Action

Norstec is an independent network of key players in offshore renewables formed in 2012. One of its key areas of activity moving forward will be articulating and communicating to a European audience the scale of the opportunity and the benefits of renewable energy from Europe's northern seas. This will be complemented at a sub-national level in England by Centres for Offshore Renewable Engineering (COREs) – a partnership between Government and six key locations for offshore wind in England – who will work to promote the benefits of the sector locally, helping to create a receptive environment for project and manufacturing facilities.¹⁶ Both groups will develop engagement plans by Autumn 2013. This work will be supported by RenewableUK who will promote the offshore renewables sector more widely.

¹⁶ The six CORE areas are: Great Yarmouth and Lowestoft, Humber, Kent, Liverpool City Region, North Eastern, and Tees Valley. For more information about COREs, please see <http://www.ukti.gov.uk/uktihome/aboutukti/item/415780.html>

No.	Detailed action	Responsible	By when
1	Publish further detail on Electricity Market Reform (EMR) implementation, including: <ul style="list-style-type: none"> i. further detail on CfD contract terms ii. final strike prices 	DECC	Aug 13 Dec 13
2	Develop process and criteria for a supply chain plan to be submitted before applying for a Contract for Difference (CfD)	DECC	2013
3	Provide open and realistic build timescales to show 'project pipelines' detailing tendering and contracting decision points to allow the supply chain to align expansion plans to market needs. The data will be published by RenewableUK.	OWIC/RUK/ Scotland Offshore Wind Industry Group (OWIG)	2013 onwards
4	Organise and run regular 'Share Fair' events where supply chain companies can learn about projects and forthcoming opportunities	OWIC/RUK	2013 onwards
5	Provide an assessment of future markets for individual elements of an offshore wind farm, including contracting decision points, through the MAS Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind), with funding from the Regional Growth Fund	MAS, with RUK, AMRC and Grant Thornton	2013 – 2016
6	Communicate benefits of offshore renewable energy across Europe and globally (Norstec) and promote local benefits (CORES), with a finalised engagement plan in the Autumn	Norstec and CORES	Autumn 2013 onwards

2. Building a competitive supply chain

As with all renewable generation technologies, offshore wind currently benefits significantly from price support, which is paid for by UK consumers through electricity bills. The Government is determined that this investment in offshore wind should deliver economic benefits through growth in the UK supply chain. It is important that developers' competitive procurement procedures are open to UK companies, that project schedules and pre-qualification processes are widely visible and accessible, and that approaches are taken to facilitate access to contracts by a broad range of companies, including SMEs and new entrants, so that companies have the opportunity to tender on a competitive basis.

For the UK supply chain to compete effectively with overseas companies, it needs to be cost competitive, innovative, provide quality and reliable products and have the capacity to bid for and win contracts. New entrants are needed to increase capacity, introduce innovations, drive down costs and help prevent bottlenecks occurring. This section identifies actions to assess the capability of the UK supply chain and provide support to companies to increase their competitiveness. It looks at how the sector can learn from other sectors to reduce costs and implement best practices. In addition it considers what more can be done to support the provision of waterside manufacturing locations which are vital for the UK supply chain.



Jacket Foundations for Offshore Wind

Courtesy of Burntisland Fabrications Limited

Issue: support for the supply chain

There is already significant UK supply chain activity in some parts of the sector but it is critical the supply chain has the capacity to meet the expected increase in demand. Some developers and top tier manufacturers have expressed concern that some supply chain companies are not always able to meet their procurement conditions, are not always cost competitive, cannot supply the volumes required and lack understanding of the sector.

Action

Government recently announced a £20m three year programme to build the competitiveness of the supply chain in England. The MAS Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind) is a new, jointly led service delivered by the Manufacturing Advisory Service (MAS), with Grant Thornton, RenewableUK and the Advanced Manufacturing Research Centre (AMRC), supported by the Regional Growth Fund. The programme will focus on SMEs already in the sector looking to increase capacity and those with the capability to enter the offshore wind manufacturing supply chain. It will provide them with market insight into customer needs and will offer a comprehensive package of support, delivered by specialists. The support will be tailored to the needs of the individual company and could take the form of support to improve positioning for new contract opportunities, an innovative design project or access to investment finance.

This builds on a number of initiatives and funds to support UK-based supply chains. In England, the Advanced Manufacturing Supply Chain Initiative (AMSCI) is a funding competition providing £120M of funding available across two rounds in 2013 (with the second round closing in October 2013) for collaborative bids across a supply chain looking to improve its competitiveness.

The sector in England can also benefit from the Regional Growth Fund (RGF) which has so far allocated £2.4bn to 300 projects and programmes which have pledged to deliver 500,000 jobs and £13bn of private sector investment. In June 2013, Government announced a further £600 million allocation for RGF. Ministers are considering the scope and timings of Round 5 of the RGF and announcements will be made in the autumn. This is further recognition of the positive impact RGF is having across England stimulating private sector investment that would otherwise not have gone ahead.

Support for individual companies looking to improve their processes and competitiveness is also in place through the Manufacturing Advisory Service (MAS).

Case Study 1: Operations and Maintenance at the Port of Grimsby on the Humber – an Enterprise Zone and CORE

The Port of Grimsby, part of Humber Enterprise Zone, is a growing centre for offshore wind Operations and Maintenance (O&M) activity. Grimsby is the closest major port to many of the Rounds 1, 2 and 3 offshore windfarms currently under



Port of Grimsby

Courtesy of ABP

construction or in the planning phase off the Yorkshire and Lincolnshire coasts. Siemens and Centrica have established O&M bases at the port which now has nearly 30 O&M vessels operating from it.

The Port of Grimsby complements other Humber Enterprise Zone sites designed for manufacturing and supply chains – some 484 hectares in total – and is playing a key part in the Humber's growth as a major UK energy estuary.

The other low carbon Enterprise Zones (Great Yarmouth and Lowestoft, Mersey Waters, Tees Valley, and the North East) also focus on offshore and renewable energy which will provide a catalyst for thousands of new jobs and support supply chain activity. For example, the North East Enterprise Zone has port facilities suitable for offshore wind survey work, servicing, component assembly and manufacturing and Mersey Waters is using a streamlined local planning process to reduce regulatory burdens, alongside enhanced capital allowances to target this sector.

There is support available at a local level, for example five Local Enterprise Partnerships (LEPs) have created low carbon energy focused Enterprise Zones offering a straightforward planning process and business-ready infrastructure for the supply chain.¹⁷ The Centres for Offshore Renewable Engineering (COREs) – a partnership between Government and six key locations for offshore wind in England including the five low carbon Enterprise Zones – will work together to develop a clear English offer for the sector and enable companies looking to invest or grow to access the best available advice and support.¹⁸

In Scotland, the Scottish Government, Scottish Enterprise and Highlands & Islands Enterprise will continue to work with the supply chain to improve understanding of the

¹⁷ Enterprise Zones are areas around the country that support both new and expanding businesses by offering incentives. There are currently 24 Enterprise Zones across England and more information can be found at: <http://enterprisezones.communities.gov.uk/>

¹⁸ The five low carbon energy focused Enterprise Zones are: Great Yarmouth and Lowestoft, Humber, Mersey Waters, North Eastern and Tees Valley.

procurement strategies of developers, ensuring that companies are geared up to be ready for requests for proposals and information as they are issued and that companies are well placed to provide a quality product at a competitive price. The Offshore Wind Expert Support Programme delivers one-to-one support to companies.

In Wales, the Welsh Government has established three Enterprise Zones dedicated to the energy sector, including Anglesey in North Wales and the Haven Waterway in South Wales, both in close proximity to planned offshore wind farms and associated infrastructure. The Welsh Government provides direct financial support to business through Repayable Business Finance and the Wales Economic Growth Fund and has a dedicated Energy & Environment sector team working with developers and supply chain businesses. The National Procurement platform – Sell 2 Wales – can be used by developers and contractors to highlight business and tender opportunities to Welsh businesses. Flexible, tailored packages of support are also available to assist in other areas, for example R&D and skills development.

In Northern Ireland, Invest NI maintains a database of businesses with capabilities in the offshore wind sector to help inform developers and Tier 1 suppliers about what could be sourced from Northern Ireland companies. In addition companies can apply for an extensive range of support including strategy development, market entry, research and development and skills enhancement. Invest NI also works with the industry to support industry-led collaborative networks to strengthen the position and capability of individual companies to secure contract wins.



Cable ready for shipping

Courtesy of JDR Cable Systems Ltd

Issue: attracting supply chain inward investment

Much of the top tier of the existing supply chain is owned by overseas companies. Therefore inward investment in production and installation facilities and the wider supply chain is key to achieving the strategy vision. As Electricity Market Reform is implemented, there is potential for Government to streamline and improve

engagement with potential inward investors in order to explain the benefits of investing in the UK .

Action

UKTI will form the Offshore Wind Investment Organisation (OWIO) to promote inward investment in the offshore wind sector in the UK. This private sector-led team will add focus, additional resource and a co-ordinating capability to the work of Government, national and sub-national bodies to develop and grow the offshore wind supply chain.

Informed by assessment of the market demand and UK supply chain capability, the OWIO will focus on the areas of the supply chain where there is potential for inward investment; identify specific foreign owned companies to target; and work with developers to follow up on their supply chain plans. The OWIO will link into UKTI's existing activities to showcase UK companies' manufacturing and engineering capabilities overseas. The success of this approach has been demonstrated by the model developed by Scottish Development International, Scottish Enterprise and Highlands & Islands Enterprise.

At a local level, Centres for Offshore Renewable Engineering (COREs) – a partnership between Government and six key locations for offshore wind in England – will continue to articulate and promote an England offer for inward investors, supported by local and national Government. In addition, UKTI has MOUs with all Local Enterprise Partnerships (LEPs) and relationships with Enterprise Zones and has mapped those with strengths and opportunities in the offshore wind sector. These relationships are used to support potential investors on local issues and requirements including skills, planning and property/land availability.

In Scotland, Scottish Enterprise, Highlands & Islands Enterprise and Scottish Development International will continue to work together to ensure companies seeking to invest have access to the support they require. In Wales, the Department for Economy, Science and Transport will ensure companies seeking to invest have access to the support they require. There is a dedicated Trade and Invest team in Wales coupled with overseas offices and representatives in key territories working to attract investors into Wales. In Northern Ireland, Invest NI works closely with its network of overseas offices around the world to offer potential investors a variety of financial and non-financial support tailored to the company's need.



Foundation for substation
at Gwynt y Môr

*Courtesy of Burntisland
Fabrications Limited*

Issue: procurement approaches

As a buyer can value a proven track record in offshore wind due to the risks involved, well qualified new entrants can find it difficult to win contracts if there is an established supply chain company competing. New entrants are necessary to increase competition, increase capacity, introduce innovation and reduce costs. It is important that these companies are given the chance to enter the market by, for example, providing the opportunity for a company to build a track record through being awarded a small initial contract to supply a wind farm project.

Procurement processes in the industry can be seen as complex, especially for smaller suppliers. Some supply chain companies commented that developers offer contracts that require them to take on high levels of risk and liability, and some experienced suppliers from the oil and gas sector consider that the level of liability required can be disproportionately high compared with the oil and gas sector. Some developers have changed contracting approaches in the light of their experience and it is essential that lessons learnt in other industries (such as oil and gas) are fully appreciated by the whole of the offshore wind industry to avoid higher costs. For example, developing standardised contracts may help address this. The *Oil and Gas Industrial Strategy*¹⁹ committed to maintain an open dialogue with the offshore renewables sector to identify areas of shared interest, such as procurement.

Action

The Offshore Wind Programme Board is taking forward work to develop, share and promote good practice on procurement and contracting approaches, picking up on The Crown Estate's Pathways Study which identified greater vertical cooperation within the supply chain as one of the supply innovations giving the largest potential for cost reduction.²⁰ Initially, the OWPB will explore possible contracting models and approaches, in particular alliancing models, to determine effective approaches, establish critical success factors, benefits and risks. Alliancing approaches may also help bring in new entrants from other sectors who could deliver innovative approaches helping to drive costs down.

The OWPB will also explore options such as:

- i. Framework agreements between developers and suppliers: A large, multi-party framework agreement, involving more than one developer, can give a supplier confidence in the future market demand for their product which may be vital to their decision to invest in new facilities. However, the complexity of arrangements involving multiple parties may be a barrier.

19 BIS/DECC (March 2013), *UK Oil and Gas Industrial Strategy: Business and Government Action Plan*, <https://www.gov.uk/government/publications/uk-oil-and-gas-industrial-strategy-business-and-government-action-plan>

20 The Crown Estate (June 2012), *Offshore Wind Cost Reduction Pathways Study* <http://www.thecrownestate.co.uk/media/305094/Offshore%20wind%20cost%20reduction%20pathways%20study.pdf>

- ii. Pre-qualification criteria: Supply chain companies have indicated that greater clarity on what is required in pre-qualification would be of benefit. Learning from other sectors, such as rail or oil and gas, may be useful.
- iii. Encouraging New Entrants: Taking on new suppliers can be a risk. Developing procurement approaches to incentivise new entrants, such as awarding smaller portions within contracts, will be explored to encourage competition and manage risk.

Issue: market and supply chain assessment

It is important to understand the requirements of the market, where key opportunities exist for UK companies and where there are supply chain risks to the sector as a whole. The potential size of the UK offshore wind market is sufficient to attract the top tier supply chain to invest in establishing manufacturing facilities which also has the benefit of supporting the lower tier supply chain to set up around them. It is this cluster of supply chain companies that offers the most benefit from creating jobs, increasing capacity and reducing costs. However, it has to be ready to deliver, so it is important to identify the bottlenecks and understand the capability in the UK supply chain to target support where it is most needed.



Jacket foundation at Ormonde

Courtesy of Burntisland Fabrications Limited

Action

For the past three years, The Crown Estate has published a supply chain gap analysis of the offshore wind industry in Europe and has recently commissioned another, which will be completed in summer 2013. Drawing on the insights gained about the UK part of the supply chain in this work, BIS will complement the study with an additional supply chain assessment looking at the extent of UK industrial capability for offshore wind and the potential for growth in different supply chain sub-elements. This will inform Government action on developing the UK supply chain. Jointly, UKTI, BIS and DECC, in consultation with the OWPB, will assess the gaps revealed by the supply chain analysis to consider if they can be filled by UK companies active in other sectors or through inward investment into the UK. Together they will develop a suitable course of action to target appropriate companies.

Issue: support for exporters

UK companies who successfully supply into the domestic market can use that success as a springboard to export their products to overseas markets. There are significant opportunities for UK companies in many markets around the globe, from close to home in Europe to further afield in the USA and the Far East. Outside Europe, UK supply chain companies can find competing for global business opportunities challenging even with UK Export Finance services.²¹ Markets such as China and Taiwan offer significant potential but also considerable challenges.

There is a strong and growing body of evidence which shows the value of strategic collaboration. Major overseas contracts are more likely to be won by building a consortium of supply chain companies with complementary skills. Consortia which present holistic solutions to overseas buyers stand a far better chance of success than a bid from individual companies.

Action

The Government provides support to UK companies wishing to export their products and services through UK Trade & Investment (UKTI). UKTI provides a range of services, from bespoke market intelligence, regulations and business practice through to participation at selected trade fairs and outward missions. It also promotes strategic collaboration and encourages the creation of consortia to secure contract wins. UKTI is now focusing its strategic trade effort on connecting UK business to the most valuable global opportunities through the High Value Opportunities (HVO) programme. Currently this programme is targeting offshore wind projects in China and Taiwan and will support UK companies to identify the opportunities, reach the key decision makers and understand the procurement milestones.

In Wales, the Department for Economy, Science and Transport has established an International Trade team advising and supporting companies to grow their exports. This can cover advice and guidance all the way through to financial support to visit markets and potential customers. Alongside UKTI, Wales has a substantial programme of overseas Trade Missions to support suppliers in exploring new opportunities and forging strategic links with trading partners in targeted sectors.

In Northern Ireland, Invest NI operates the Export Development Service (EDS) delivering one-to-one support from industry experts to improve understanding of procurement requirements, identify opportunities and develop company capability to meet requirements. Invest NI also implements a targeted Overseas Events Programme and supports companies to visit key sectoral events in the UK and Europe, facilitating them to present their capability to overseas buyers, secure strategic partnerships and

21 See <http://www.ukexportfinance.gov.uk/assets/ecgd/files/prods-servs/quickguides/quick-guide-to-ecgd-v7.pdf> for a quick guide to UK export finance

win business. Targeted programmes have also been created to assist companies in gaining the necessary technical accreditations to operate in this sector.

Issue: ports and waterside infrastructure

Ports, waterside locations and fabrication yards have three main functions in offshore wind: manufacturing sites where waterside locations with space for factories are required; marshalling / installation ports where the components are consolidated before loading onto installation vessels; and operations and maintenance bases. The most significant challenge is developing UK manufacturing sites, where European ports are often able to offer cheaper space and services.

The increased size of next generation designs means that the main turbine components will need to be produced at waterside locations as it is not practical to transport them over land. Sites need to be large because of the size of turbines and foundations, as well as the need for buffer storage space due to the seasonal nature of installation. Sites also require a quayside with suitable load bearing capacity and sufficiently deep water to allow access for increasingly large vessels.

Significant UK port land is available to offshore wind manufacturers although there are barriers to its development. UK ports are predominantly privately-owned while on the Continent the majority are publicly owned. While port owners can invest speculatively to some extent, they need the right motivations and market conditions and will not necessarily consider the wider socio-economic benefits of offshore wind development in an investment decision. If infrastructure investment is not undertaken, there is a risk that existing developments (possibly expanded) at Continental sites will become permanent options for supply.

Cost efficiencies can be achieved by manufacturers locating close to each other and to the deployment sites. These manufacturing clusters can drive cost efficiencies through sharing their supply chains and infrastructure costs.

To date there has been some port development for manufacturing in the UK including those by JDR Cables Systems Ltd (Hartlepool), TAG Energy Solutions Ltd (Tees Valley), Steel Engineering Ltd (Renfrew), Global Energy Group (Nigg) and Burntisland Fabrications Ltd (Burntisland and Arnish sites). However, more is needed.

Installation facilities are required for marshalling of components which may have been manufactured elsewhere. Ports have been used as well as temporary facilities moored in harbours. A large manufacturing facility could also double as an installation facility for other components. Due to the high daily cost of installation vessels, coupled with the speed of deployment, there is a significant cost advantage in using an installation port

close to the site of the wind farm. Where investment is needed to develop facilities at an installation port, this is more readily justified when the costs can be spread over a number of projects.

The most significant UK installation port development so far has taken place around the Irish Sea with the development of port facilities for foundation and turbine installation in the ports of Mostyn, Barrow and Belfast and the Cammell Laird ship yard. This development has been largely driven by the fact that projects in this region cannot be economically served from Continental locations. In contrast, while projects on the UK's east coast have been served from ports in the UK, including Great Yarmouth, Harwich, Hartlepool, Hull and Lowestoft, they have also been served from more developed facilities in Denmark, France, Belgium and the Netherlands.

Case Study 2: Belfast Harbour

Belfast Harbour invested £53m to develop the UK's first dedicated port facility for the offshore wind sector, which is now occupied by DONG Energy under a long term lease. The fact that DONG holds a number of licences for offshore wind farm development in the Irish Sea, meant Belfast Harbour was able to secure the necessary long term commitment from DONG Energy to develop the facility. Belfast Harbour's ability to execute the development project quickly in terms of consenting, procurement and construction was also key.



H&W Load out of Robin Rigg

Courtesy of Harland and Wolff Heavy Industries Ltd



Harland and Wolff

Courtesy of Harland and Wolff Heavy Industries Ltd

Northern Ireland's major ports – Belfast, Warrenpoint and Londonderry – are trust ports and utilise their own profits to finance new infrastructure. Warrenpoint and Londonderry Harbour have both increased their investment into port infrastructure.

Operation and maintenance bases are established in existing ports close to wind farms. Significant jobs and high UK content have been achieved in existing bases such as Barrow, Grimsby, Lowestoft, Mostyn, Ramsgate and Workington.

Action

To help unlock the significant port land available, DECC is expanding the scope of its offshore wind manufacturing funding scheme to allow ports/landowners at coastal locations to apply to support infrastructure development in assisted areas of England. This will help make it clearer to prospective manufacturers of key offshore wind components what potential public support could be available when considering sites for their facilities at coastal locations. Any grants offered will be conditional on sites securing manufacturing investment. The changes made to the scheme do not apply to any existing applications already submitted and being assessed. Guidance and other conditions of the scheme for applicants can be found at: <https://www.gov.uk/offshore-wind-part-of-the-uks-energy-mix#business-development-and-funding-guidance>. In Scotland, the Scottish Government has a fund of £70m to support infrastructure development at Scottish port sites.²²

In addition, ports are eligible to apply for the UK Guarantees Scheme to guarantee the debt finance to upgrade port infrastructure for renewable energy projects (described further in the section on *Finance*).

The Crown Estate intends to act as a facilitator with interested ports and manufacturers, using its knowledge and expertise to play a key role in helping ports to realise the potential in their sites. It will continue to co-ordinate discussions with offshore energy developers, along with other marine energy stakeholders, to understand the full requirements of and challenges to the offshore wind development programme. This will help to identify where upgrades to existing port facilities are needed, or indeed completely new facilities, and to understand how these can be managed and delivered.

Issue: measuring UK content

Measuring UK content in the supply chain for all UK offshore wind projects would enable both industry and Government to track progress towards the OWDF vision of over 50% UK content in offshore wind farm projects and gather hard data on where the UK is delivering a strong competitive supply chain and where it is not. This would help identify interventions, whether by Government or industry, to boost UK competitiveness.

Action

Developers have agreed to measure UK content for both capital and operating expenditure, using a methodology being developed by the OWPB. They will use this to review progress on increasing UK content in offshore wind farm projects.

²² <http://www.scotland.gov.uk/News/Releases/2010/11/02131033>

Case Study 3: Scroby Sands and Robin Rigg Offshore Wind Farms are estimated to achieve 50% UK content

Two UK wind farms are expected to achieve 50% lifetime UK content (including capital and operating expenditure). However, to achieve a higher content in capital expenditure (CAPEX) and achieve the Vision of this Strategy will require a different approach to incentivise new entrants and encourage competition, diversification from other sectors and inward investment of key suppliers.



Scroby sands

Courtesy of E.ON Climate & Renewables UK

Analysis of E.ON Climate and Renewables' 180MW Robin Rigg offshore wind farm was completed in 2009. Analysis shows UK content in the capital expenditure was 32% and UK content in the operational expenditure in the first year was 86%.²³ Given that approximately two-thirds of the cost of this offshore wind farm was incurred during the construction phase, the lifetime UK content will be in the region of 50% for capital and operational expenditure combined. The main UK content contributions in capital expenditure arose from installing and commissioning, balance of plant manufacturing and project management.

E.ON Climate and Renewables' 60MW Scroby Sands was the second of the UK Round 1 offshore wind projects to be constructed and was completed in December 2004. Analysis²⁴ shows 45% of the value of the CAPEX contracts was sourced from UK companies and 83% of the operational expenditure in the first five years was sourced from UK companies. The lifetime proportion, by value of the contract, which was sourced from the UK is estimated to be in the region of 55%.



Robin Rigg

Courtesy of E.ON Climate & Renewables UK



Offshore substations at Robin Rigg

Courtesy of Alstom Grid

²³ *UK content analysis of Robin Rigg offshore wind farm*, A report commissioned by E.ON Climate & Renewables from BVG Associates, September 2011 and *UK content analysis of Robin Rigg Offshore Wind Farm operations and maintenance*, A report commissioned by E.ON Climate & Renewables, BVG Associates, July 2012

²⁴ *Scroby Sands – Supply Chain Analysis*, Final Report, A Report to Renewables East by Douglas-Westwood Limited and ODE Limited, Commissioned by the DTI, DWL Report Number 334-04, July 2005

Case Study 4: Routes to Delivering Higher UK Content in an Offshore Wind Farm

Three potential “Routes” illustrate how future offshore wind farms could be built with higher UK content in the capital expenditure.

Route 1: Broad tier 1 focus

In Route 1, the focus is on securing investment from established or new offshore wind suppliers, the manufacture of turbine towers, UK turbine assembly and balance of plant. components such as foundations, substation structures or cables, where significant value is added at the upper levels of the supply chain and UK content can be increased by securing UK located facilities. In most cases new facilities at quaysides will be needed supporting jobs across the supply chain and export opportunities. While some of the supply chain facilities are explicitly for offshore wind, others could supply different emerging markets.

Route 2: Turbine supply chain focus

Maximising UK content in the turbine would require investment in UK-based manufacturing facilities including assembly, blades, drive train components (generators, gearboxes, shafts) and large castings and forgings. It would also require turbine manufacturers to collaborate with the UK-based lower tier supply chain as many of the components are technology dependent and specific to individual turbine manufacturers.

Route 3: UK indigenous supply chain focus

In Route 3, the focus is on growing the existing UK supply chain where the UK already has a competitive edge, such as development and survey work, converters, array cables, installation and operation, maintenance and service, as well as elements that have synergies in sectors where the UK is already successful such as oil and gas, automotive, and defence. Most will be lower tier suppliers, or existing UK-based suppliers looking to grow their volume and market share.

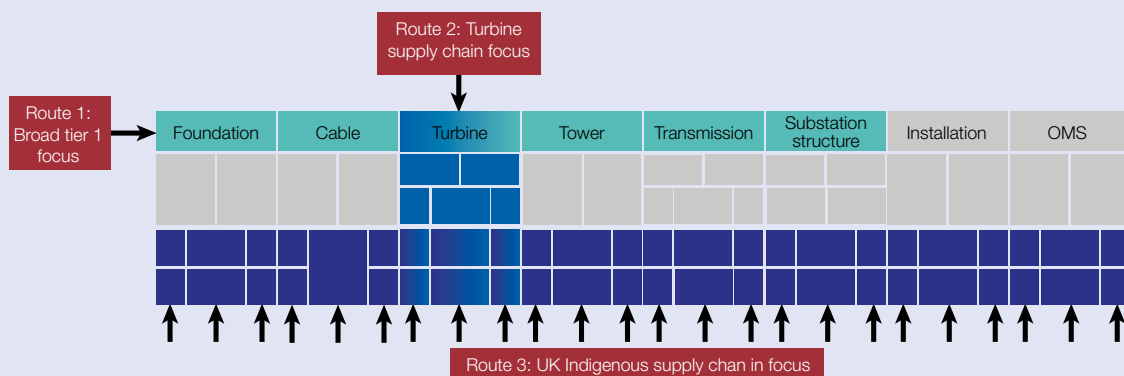


Figure 1: Three main routes to increased UK content in a UK offshore wind farms

It is difficult to get sufficient UK content to deliver a 50% CAPEX ambition from any one route since Routes 1 and 3 achieve about 40% and Route 2 achieves 35% UK content in CAPEX, so effort across all 3 fronts will be needed to deliver over 50%.

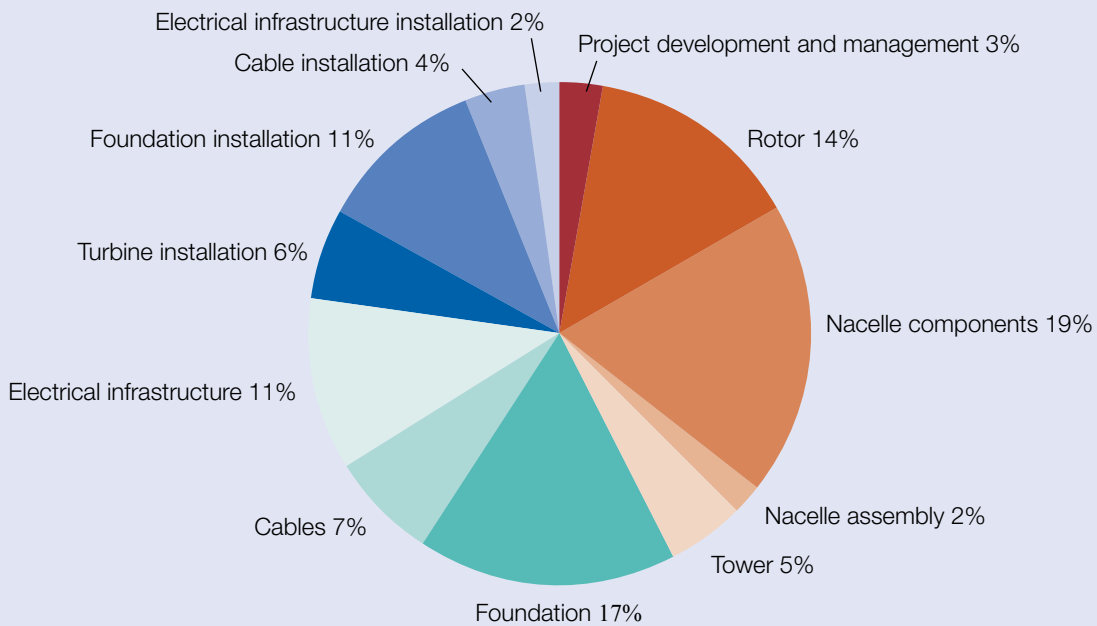


Figure 2: breakdown for typical capital expenditure for an offshore wind farm

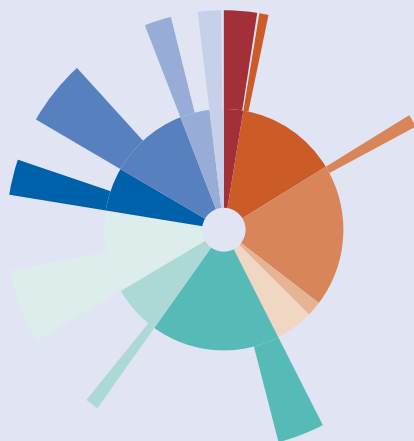


Figure 3: Average UK Content 2012 in capital expenditure approximately 25%

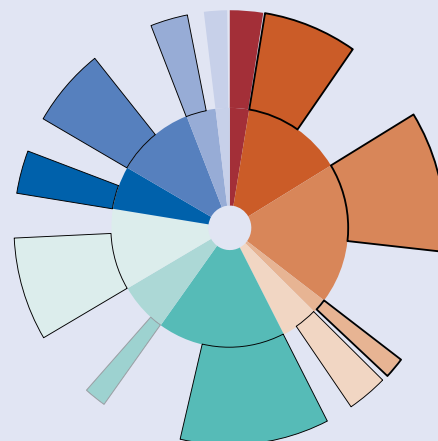


Figure 4: Possible outcome from combining routes 1, 2 and 3 delivers over 50% UK content. Black line areas show areas of change between the diagrams in this Figure, compared to Figure 3

This analysis has been developed estimating the current UK content (about 25% of CAPEX) in the latest offshore wind farms. The diagrams represent about 70% of the undiscounted value of lifetime costs of an offshore wind farm, with the remaining costs occurring in O&M and decommissioning.

Issue: learning lessons from other sectors

The UK has successful industrial sectors that could contribute to expanding the UK-based supply chain for the offshore wind sector. Companies looking to expand and diversify into the offshore wind supply chain can transfer their knowledge and skills. For example, the UK has played a leading role in the offshore oil and gas sector where many of the disciplines are directly transferable to the offshore wind sector. Particular areas of focus are the fabrication of large steel structures (foundations, towers and piles), offshore installation and operation and maintenance where the UK excels and can bring a proven track record of expertise. Further lessons could be learnt from exploring synergies with the contracting models and the approach to risk-sharing used in the oil and gas sector.

The automotive industry has built a deep competitive supply chain feeding large scale manufacturers. This sector has identified best practice in, for example, automation and standardisation, which could transfer to the offshore wind sector and deliver significant costs savings. The UK aerospace sector has expertise in lightweight materials, aerodynamic structures and automation that has potential relevance to the offshore wind sector. Logistics is another area with synergies to the offshore wind sector, particularly as the construction and operation of larger wind farms becomes more complex.

Action

The overarching Industrial Strategy Council will support sharing of learning between sectors. The overarching Industrial Strategy Council is made up of members from all the Chairs of the individual sector councils, including the Offshore Wind Industry Council, as well as representatives from wider sectors and cross-cutting areas. It is a forum to share progress and best practice between sectors as well as consider responses to cross-cutting issues and develop the Government's overall approach to industrial strategy.

The OWPB is considering the applicability of oil and gas sector initiatives relating to cost reduction and efficiency in the supply chain. A number of initiatives have been identified and analysed in a report for The Crown Estate and the OWPB will select which initiatives should be taken forward in the offshore wind sector.²⁵ RenewableUK and Oil & Gas UK will work together to improve the sharing of knowledge and information between them and have identified joint liaison officers to foster closer ties.

In Scotland, the Scottish Enterprise publication *A guide to offshore wind and oil and gas capability* provides detailed information to the oil and gas supply chain on those areas of the offshore wind project life cycle where there is the greatest opportunity for oil and gas involvement and growth.²⁶

25 Report by Douglas Westwood for The Crown Estate and DECC (March 2012), *Applicability of Offshore Oil & Gas Initiatives to the Offshore Wind Industry* http://www.thecrownestate.co.uk/media/358188/owdf_07_2012_-pilot-study-final-report.pdf

26 Scottish Enterprise (September 2011), *A Guide to Offshore Wind and Oil and Gas Capability* <http://www.scottish-enterprise.com/-/media/SE/Resources/Documents/GHI/Guide-offshore-wind-oil-gas.ashx>

No.	Detailed action	Responsible	By when
7	Deliver the MAS Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind), supported by £19.9m from the Regional Growth Fund	MAS, with RUK, AMRC and Grant Thornton	2013 – 2016
8	Ensure companies investing in the sector in England understand and can access the support on offer locally	COREs	2013 onwards
9	Establish a new Offshore Wind Investment Organisation to deliver inward investment into the UK	UKTI	Autumn 2013
10	Explore contracting models and approaches, including approaches to increasing collaboration, framework agreements between developers and suppliers, and approaches to facilitating new entrants to the market	OWPB	2013 onwards
11	Undertake a supply chain gap analysis, supplemented by a complementary high level assessment of the UK supply chain capability	The Crown Estate/BIS	Autumn 2013
12	Promote export opportunities through the High Value Opportunities Programme, promotion of strategic collaborations and practical support to companies	UKTI and SDI	2013 onwards
13	Expand the scope of the offshore wind manufacturing funding scheme for England	DECC	2013
14	Measure and share information on UK content in offshore wind developments for both CAPEX and OPEX, using the methodology being developed by the OWPB, and review progress on increasing UK content	OWIC (developers)/OWPB	2013 onwards
15	Promote knowledge sharing with the oil and gas sector, including through joint liaison officers in the trade associations to foster closer ties	RenewableUK/ Oil & Gas UK/OWPB	2013 onwards

3. Supporting innovation

By 2050, offshore wind innovation has the potential to deliver cost savings of £45bn and business creation for the UK worth £18bn.²⁷ It could also accelerate deployment and boost economic growth and jobs by building the UK supply chain and attracting investment from the UK and overseas, as well as enabling UK firms to develop products, skills and services for export worldwide.

Innovation, testing and demonstration must be primarily driven by industry with the Government's role to enable activity where market failures and barriers deter industry activity. Both industry and Government share the same ambitions of reducing the costs of offshore wind and developing a sustainable growth industry.

Issue: fostering innovation

The Government and public sector-backed organisations work together as the Low Carbon Innovation Co-ordination Group (LCICG) to support low carbon innovation.²⁸ The group aims to maximise the impact of UK public sector funding for low carbon technologies in order to deliver affordable, secure, low carbon energy for the UK, deliver UK economic growth and develop the UK's capabilities, knowledge and skills.

The LCICG coordinates public sector support for offshore wind and has developed a shared evidence base to inform the prioritisation of public sector investment in low carbon innovation known as Technology Innovation Needs Assessments (TINAs).²⁹

The TINA for offshore wind highlights that innovation has the potential to drive down costs of offshore wind by c.25% by 2020 and c.60% by 2050.³⁰ With a high level of innovation coupled with other cost reduction activities, the cost of energy from offshore wind power would be about £100/MWh by 2020 and £60/MWh by 2050. It identified that the largest potential to save costs was in turbine development, foundations and installation which collectively accounted for c.70% of the cost of offshore wind energy. Turbines alone contribute 28% towards the cost of energy generation with innovation in this area potentially contributing £18bn in energy cost savings by 2050. Next generation turbines with a reliable and high yield are expected to significantly reduce the cost of offshore wind energy.

To progress innovation in the sector, businesses highlight the need for more clarity, consistency and certainty to give them the confidence to take innovative projects to market. Many companies emphasise the importance of support being available throughout the innovation journey, so that innovation projects move smoothly and

27 Offshore Wind Technology Innovation Needs Assessment (TINA): http://www.lowcarboninnovation.co.uk/working_together/technology_focus_areas/offshore_wind/

28 For further information, please see www.lowcarboninnovation.co.uk

29 Offshore Wind Technology Innovation Needs Assessment (TINA): http://www.lowcarboninnovation.co.uk/working_together/technology_focus_areas/offshore_wind/

30 The innovation impact potential was defined by the offshore wind TINA as “aspirational but feasible”.

quickly from concept to commercialisation. Companies, particularly those new to the energy sector, look for help to navigate the support available and identify the right partners for project and funding support.

Action

The LCICG members together are providing over £100 million of targeted financial support to develop innovative offshore wind technologies between 2011 and 2015. These technologies will play a key role in reducing the cost of offshore wind energy and knowledge development in the sector. This support includes:

- The Research Council's Supergen Wind programme – a consortium with seven research partners and the active support of 18 industrial partners including wind farm operators, manufacturers and consultants.
- The Energy Technologies Institute's Offshore Wind programme which includes projects to accelerate the development and demonstration of both very long blades and floating platforms and a test rig capable of testing complete drive trains and nacelles up to 15MW aimed at improving the reliability of offshore wind turbines.
- DECC and TSB's Offshore Wind Component Technologies Development and Demonstration Scheme aimed at supporting testing and demonstration of devices and innovation in component technologies for all sub-areas of large offshore wind systems.
- TSB's programme aimed at developing an innovative UK supply chain.
- The Scottish Government's Renewable Energy Investment Fund for innovative renewables including offshore wind technology developers.

In late 2013, the LCICG will publish a Low Carbon Innovation Strategy setting out a shared vision to 2020 outlining the aims, principles, approach and technologies identified as important to the UK. As part of the strategy development, LCICG is working with industry to identify the biggest innovation challenges. The strategy will also improve the consistency and coherence of support so that companies developing technologies have the confidence to take innovation projects through to market.

Issue: delivering transformational innovation

To move the offshore wind industry forward at pace, key players from industry need to work together and with academia and the public sector to identify the innovation challenges, share learning and develop solutions.

Action

The Technology Strategy Board has confirmed £46.1 million of funding to the Offshore Renewable Energy (ORE) Catapult over its first 5 years of operation. The aim of the ORE Catapult is to be the “go to place” for organisations in offshore renewables innovation; integrating the key players from the sector and acting as a powerful hub to galvanise all UK innovation work streams and test assets. The ORE Catapult is not a grant giving body, but will work closely with the LCICG and industry to coordinate an innovation approach that ensures learning is shared and that innovation challenges are visible to both Government and supply chain companies that might develop solutions. It will have a pivotal role in strengthening collaboration between industry, academia and the public sector in offshore renewable innovation in the UK.

In Northern Ireland, Invest NI is supporting the development of a new Competence centre in Renewable Energy for Northern Ireland. The Centre for Advanced Sustainable Energy (CASE) will be an industry driven research centre looking into a number of key areas including: turbine development, manufacture and decommissioning; integration and storage; energy efficiency and biomass.

Case Study 5: Catapults – a new force for innovation and growth

The Offshore Renewable Energy (ORE) Catapult is one of seven initial Catapults being established and overseen by the Technology Strategy Board. Together these represent a £1bn public and private sector investment over the initial five years period.

The Catapults are technology and innovation centres where the very best of the UK’s businesses, scientists and engineers can work side by side on research and development – bringing a critical mass of activity to particular sectors of high potential in order to accelerate the best research and concepts into new products and services that generate economic growth.

The Offshore Renewable Energy Catapult

The Offshore Renewable Energy (ORE) Catapult has been set up to lead the transformation of the offshore renewable industry’s approach to innovation, bringing together a diverse sector and enabling innovative companies to commercialise new products and services in emerging UK and overseas markets. Its goal is to provide market access for new technologies while driving greater efficiency, creating sustainable UK-based offshore wind, wave and tidal industries.

The Catapult will establish projects to find innovative solutions to real industry problems prioritised for risk, cost benefit and innovation acceleration, fully involving the academic and public sectors. Driving innovation will create opportunities for new entrants and new technologies, and support incoming manufacturing investment in the UK – thereby maximising UK benefit and providing opportunities for UK-based manufacturing and service companies.

The Catapult will recruit approximately 120 industry experts and technologists to lead innovation practices and provide support services to others, such as SMEs. The team will become a hub for all UK innovation work streams and test assets collaborating with innovation service providers to de-risk and commercialise technological solutions. Advisory groups are being established covering academic, industry and collaborative working.

One key area the Catapult has taken on board following the recommendation in the *Cost Reduction Task Force Report*³¹ is to drive standards in the industry further. Many other industries successfully use standards as they mature, to drive progress and open the supply chain to new entrants. Standards can play a vital role in fuelling innovation, promoting competition, lowering technology costs and accelerating market growth, particularly when they are the result of an industry-led, consensus-based, open and transparent process, and voluntarily adopted in the market.

Issue: testing and demonstration

Test and demonstration sites are essential to support the commercialisation and deployment of innovative turbines and foundations. The Offshore Wind Cost Reduction Task Force identified the availability of test sites as a key action to deliver cost reduction towards the £100/MWh target. Demonstration projects are technically very complex, difficult to consent and finance so companies acting alone are often not able to deliver the testing capacity needed.

There is a significant amount of support from industry and Government to ensure that the right testing and demonstration occurs but more is required both to de-risk existing sites and create alternative demonstration elements within commercial wind farms. More sites with different conditions are needed to test new and larger turbines and their foundations, along with new approaches to consenting, financing and operating sites.

31 The Offshore Wind Cost Reduction Taskforce (2012), *Offshore Wind Cost Reduction Task Force report*

Action

Government and industry will continue to work to bring forward the development of offshore wind testing facilities in the UK. The UK has a large proportion of all European offshore demonstration sites under development, most significantly the European Offshore Wind Deployment Centre at Aberdeen Bay and the National Renewable Energy Centre (Narec) demonstrator at Blyth. In addition to testing turbines and foundations, the UK also provides world class facilities for testing components. For example, Narec has facilities to support development of high yield reliable turbines: the Blade Test 2 facility, the largest in the world and capable of testing blades up to 100m in length, alongside the ETI commissioned 15MW wind turbine drive train test rig.



NAREC 100m blade test facility
Courtesy of National Renewable Energy Centre



NAREC Powertrain facility Fujin
Courtesy of National Renewable Energy Centre

The DECC-funded Carbon Trust Offshore Wind Accelerator is incentivising developers to demonstrate novel foundation designs and to commercialise other innovations. The OWA has had various successes, including the demonstration of foundations to support offshore met masts in deep water, and has a fund of £18m to incentivise demonstration of three novel foundations with turbines.

Case Study 6: The DECC funded Carbon Trust Offshore Wind Accelerator (OWA). A joint industry project that aims to reduce the cost of offshore wind by at least 10% by 2015.

Set up in 2008, the OWA involves nine offshore wind developers with 77% (36GW) of the UK's licensed capacity. It aims to reduce the cost of offshore wind in time for Round 3 developments through innovation. Technology challenges are identified and prioritised by the OWA members based on the likely savings and the potential for the OWA to influence the outcomes. Projects are undertaken to address these challenges, often using international competitions to inspire innovation and identify the best new ideas. The most promising ideas are commercialised via tailored projects for concept development, de-risking and demonstration. The OWA works closely with the supply chain throughout the process.

The OWA model is highly collaborative, involving more than 150 technical experts from nine developers who share knowledge and steer the development of new innovations. The OWA is two-thirds funded by industry and one-third funded by DECC.

The OWA currently focuses on five areas:

1. **Foundations** – Developing new turbine foundation designs for 30-60m water depths that are cheaper to fabricate and install
2. **Access systems** – Developing improved access systems to transfer technicians and equipment onto turbines for operations and maintenance in heavier seas
3. **Wake effects** – Improving the layout of large wind farms to reduce wake effects and optimise yields
4. **Electrical systems** – Developing new electrical systems to reduce transmission losses and increase reliability
5. **Cable installation** – Improving cable installation methods



Top left: Keystone Engineering's twisted jacket
 Middle: Universal Foundation suction bucket on jackup
 Top right: FLIDAR at Gwynt y Môr

All Courtesy of Carbon Trust

To date, these programmes have successfully developed and demonstrated:

- a new type of Universal Foundation and Keystone 'twisted jacket' foundation designs to support met masts at Dogger Bank and Hornsea;
- new access systems including Fjellstrand WindServer service vessel and the BMT Houlder TAS transfer system;
- faster, more accurate wake effects models DTU Fuga and Ansys WindModeller; and
- floating LIDAR systems to measure wind speed at the Gwynt Y Môr site.

The Crown Estate is developing a new leasing programme to facilitate demonstration of technology breakthroughs, including a specific leasing round for new floating solutions for deep water as well as extensions to existing sites and non-grid

connected sites and implementation of improved processes and contracting. This programme will facilitate the demonstration of innovative turbines on new and existing offshore project sites that will demonstrate cost savings both to 2020 and beyond. By de-risking commercial arrays and providing multiple paths for cost reduction, projects will increase confidence for investors deploying new products.

As part of this proposed testing and demonstration programme, The Crown Estate will launch a Cost Reduction Monitoring Framework, designed to monitor cost reductions and share best practice across industry. Scheduled for roll out in Q3 2014, the aim is to bring consistency and transparency to progress towards achieving £100/MWh by FID in 2020 and provide more efficient industrial development in the next 10 years by sharing knowledge.

The Marine Management Organisation will also work with The Crown Estate and its partners to explore options to streamline the consenting process for testing and demonstration of offshore technologies.

In Scotland the Scottish Government, its enterprise agencies and industry will continue to maximise the opportunities at the onshore facility at Hunterston and the single offshore site at Methil. This work will be further enhanced by the work Highlands & Islands Enterprise will undertake to develop test and demonstration sites within their area in the coming years. The Scottish Government is also introducing two new Renewable Obligation Certificate bandings to support offshore test and demonstration sites deploying innovative turbines and for projects piloting non-fixed generation such as floating turbines (2.5 ROCs and 3.5 ROCs respectively for projects that have generating stations with preliminary accreditation by end March 2017). This is supported by the £35m Prototyping for Offshore Wind Energy Renewables Scotland (POWERS) framework to target inward investment for offshore wind turbine manufacturers, as well as the £15m Scottish Innovative Foundation Technologies Fund (SIFT) that promotes innovative solutions for foundation structures.

No.	Detailed action	Responsible	By when
16	Publish a Low Carbon Innovation Strategy setting out the Government's vision for low carbon innovation support, including offshore wind, to the end of the decade	LCICG	Late 2013
17	Provide £46.1m of funding over 5 years for the new Offshore Renewable Energy (ORE) Catapult to galvanise all UK innovation work streams and test assets	Technology Strategy Board	2013 -2018
18	Build on the work by the Offshore Wind Accelerator and continue to work to bring forward the development of offshore wind testing facilities in the UK	Government, developers and manufacturers	2013 onwards
19	Deliver a test and demonstration leasing programme to facilitate successful demonstration of technology breakthroughs, through extensions to existing sites, new sites and non-grid connected sites and implementation of improved contracting to help lower costs	The Crown Estate	2013 onwards
20	Launch a Cost Reduction Monitoring Framework, designed to track progress in achieving levelised cost reductions and share best practice	The Crown Estate	2014
21	Explore options to streamline the consenting process for testing and demonstration of offshore technologies	The Marine Management Organisation, The Crown Estate and partners	2013
22	Progress a suitable test and demonstration site in the Highlands and Islands for technology from 2016 onwards	Scottish Enterprise and Highlands & Islands Enterprise	From 2016

4. Finance

The ability of companies to access reasonable cost finance is a key driver for building a competitive industry. This is particularly important for the offshore wind sector because of the high upfront capital costs generally required to enter the market. The development of offshore wind farms requires two distinct types of finance. Developers need finance for the capital expenditure costs of a project whereas the supply chain often requires financial investment in facilities and equipment. While the scale of investment is different for developers and supply chain, across the economy the economic climate means that businesses can find it hard to access finance.

Issue: finance for developers

Developers in the past have typically financed the development, construction and operation of wind farms directly from their balance sheets. It has been estimated that the ‘big six’ utilities companies together would be able to fund around £2bn, which equates to approximately 600MW of new capacity, with relative ease.³² With the move to larger, deeper and further from shore sites, coupled with the general economic climate, it is becoming increasingly necessary to leverage a variety of different financing options.

Action

Typically, large wind farm developers will need to access billions of pounds of external finance, depending on the size of the construction zone. Government provides a number of principal vehicles to address financing of this scale:

- The Green Investment Bank (GIB) is a Government financed £3.8bn commercial bank, supporting 5 key environmental sectors, with a mission to accelerate investment in the UK’s transition to a green economy. Offshore wind is one of GIB’s priority sectors where GIB has an ambition to invest over £1bn in the period to March 2015, co-investing in projects with commercial parties. GIB investments in the sector are likely to range from refinancing operating wind-farms to financing construction of new wind-farms. GIB would also consider co-investment on commercial terms in testing and demonstration projects.
- As part of UKTI’s work to attract investment into the UK, the organisation’s institutional Investment & Infrastructure team has a specific responsibility to draw in capital investment into the development of the UK’s infrastructure and in particular the UK’s energy sector. A priority is investment in renewables and especially offshore wind.

³² Report from the Finance Sub-Group to the Offshore Wind Developers Forum (June 2011)
http://www.thecrownestate.co.uk/media/229356/owdf_04_01_finance_group_paper.pdf

- Infrastructure UK (IUK) has a remit to provide greater clarity and coordination over the planning, prioritisation and enabling of investment in UK infrastructure; and to improve delivery of UK infrastructure through achieving greater value for money.
- The UK Government has invested £50m in the IPO flotation of Greencoat UK Wind plc which is a sector-focused infrastructure fund investing in UK wind generation assets both onshore and offshore. Refinancing of operational assets will promote further asset building by utilities.
- With the introduction of the Contract for Difference (CfD), post construction refinancing will become more assured attracting pension fund and sovereign wealth investment. This will aid the recycling of capital for further deployment.

Case Study 7: Investing in Offshore Wind

The Green Investment Bank (GIB) made its first direct equity investment in offshore wind through the acquisition of a 24.95% stake in a 90MW wind farm located 8km off the coast of North Wales. GIB acquired the stake in Rhyl Flats Wind Farm Limited from companies owned by RWE AG (RWE) for a cash consideration of £57.5m. Rhyl Flats was an ideal investment for

GIB as it will help to develop the market for buying and selling operating offshore wind assets, allowing the release of capital back to the original developers, which can then be invested in new renewable projects in the UK. At the same time as developing a market, this investment will deliver a commercial return to the bank. This landmark transaction represents a significant step for GIB in supporting one of its core sectors, offshore wind.³³



Rhyl Flats

Courtesy of RWE

Issue: finance for the supply chain

The UK supply chain will need finance to invest in new facilities and equipment to meet expected demand. Accessing finance at a reasonable cost is an issue for companies bringing new innovative technology to market and setting up new facilities, and can be particularly difficult for SMEs. Typical facility finance structures require a payback period between 10-15 years, but the payback period for capital equipment could be longer and can be difficult to secure because the UK market for offshore

³³ <http://www.greeninvestmentbank.com/userfiles/files/case-studies/GIB-case-study-Rhyl-Flats.pdf>

wind is perceived to be uncertain post 2020. Companies need greater visibility of the future market to make investment decisions.

Action

As well as the business support programmes described in the section on *Building a competitive supply chain*, Government has a number of initiatives, delivered in partnership with the private sector, to help businesses access the finance they need to grow. These are part of the Business Bank programme³⁴, and include:

- Enterprise Capital Funds, an equity investment scheme to help fill the equity gap where viable business investment proposals are unable to attract investment from venture capitalists or informal investors
- Business Angel Co-investment Fund, a public/private co-investment equity based finance scheme
- Enterprise Finance Guarantee, which facilitates debt finance up to £1m for viable SMEs lacking adequate security or a proven track record for a normal commercial loan.

The Business Bank will remove significant barriers to growth by tackling long standing structural problems in the supply of finance to UK SMEs and mid-sized corporates. It is expected to become fully operational in 2014, and is bringing together £2.9bn of existing commitments with £1bn of new Government capital. These funds will leverage institutional investment, enabling more lending to SMEs and mid sized companies.

One of the bank's primary objectives is to increase the supply of capital through non-bank lending channels and help to diversify the types and sources of finance available. As part of the Business Bank initiative BIS launched the Investment Programme in April 2013 as a £300 million co-investment scheme through which Government will invest, alongside private sector investors, in lending businesses that seek to address the inadequate access to finance available to small and medium sized enterprises in the UK.

For SMEs, the Small Business Tranche of the Business Finance Partnership has allocated £87m, plus at least the same again in match funding from the private sector, to new or innovative lenders. These include peer to peer lending platforms, supply chain finance providers and asset backed lenders. The broader Business Finance Partnership programme has a separate allocation of £1.1 billion, which will be invested alongside private sector capital, to support non-bank lending to mid-sized businesses.

34 BIS Policy Paper (March 2013), *Building the Business Bank: Strategy Update*
<https://www.gov.uk/government/publications/building-the-business-bank-strategy-update>

In addition, the UK Government is providing support for infrastructure projects via the UK Guarantees Scheme which could provide up to £40 billion in guarantees for priority infrastructure projects.³⁵ Waterside manufacturing locations for renewable energy projects are considered eligible so the scheme could be used to guarantee debt finance for a port or other waterside location to upgrade its infrastructure.

Issue: supply chain bonds

Project developers often require a ‘performance bond’ or guarantee to underwrite the contract and ensure delivery. These can be difficult or expensive for small companies to obtain in comparison with a company which is part of a large multinational and may offer a ‘parent company guarantee’. Coupled with the high capital set-up costs, this means that each project may require the company to have access to funds for approximately 70% of the contract value before work can start – including the bond required by the developer/contractor and the cost of the raw material.

Action

The Business Bank – drawing on the experience of Tees Valley Unlimited’s £10m Tees Valley Catalyst Fund – will look at the feasibility of improving affordability of the bonds/guarantees required by supply chain companies’ customers. In doing so, it will examine the common issues across offshore wind and other sectors. The Tees Valley Catalyst Fund, supported through the Regional Growth Fund, will assist supply chain companies in the region to access the performance and warranty bond facilities they require when bidding on large contracts. This will unlock a barrier to growth by removing the limitation that companies otherwise have to provide the security for bonds from their company balance sheets.³⁶

Issue: cost of capital

Businesses have reported that the cost of finance to the offshore wind sector can be higher than other industries due to the market’s perception of the risk, particularly during the construction phase which has a unique risk profile. Moreover, because offshore wind is a comparatively new sector it is less understood than oil and gas, which also impacts access to finance. The Cost Reduction Task Force identified the need to better educate the finance sector (including insurance companies) on true risk.³⁷ More competitive finance streams should be unlocked as the risk profile becomes better understood by the financial industry.

35 HM Treasury (March 2013), *Infrastructure delivery update*, page 4, 5 and 12 http://www.hm-treasury.gov.uk/d/infrastructure_delivery_update_200313.pdf

36 The Tees Valley Catalyst Fund is a £10million programme providing finance for warranty bonds for Tees Valley companies looking to bid on large contracts http://www.fwcapital.co.uk/funds_we_manage/tees_valley_catalyst_fund.aspx

37 *Offshore Wind Cost Reduction Task Force report*, Finance section action 29

Action

Government will work to ensure that the financial industry understands the real risk of investing in offshore wind and other energy sectors by facilitating discussion and engagement between the financial services sector and the main energy trade associations (including oil and gas) to understand fully the scale of the issues for companies seeking to access finance and to explore solutions.³⁸

No.	Detailed action	Responsible	By when
23	Look to invest over £1 billion in offshore wind, co-investing in projects with commercial parties	Green Investment Bank	Ongoing
24	Address gaps in the supply of finance to small and mid-sized companies through current schemes and the new Business Bank	BIS	Fully operational 2014
25	Consider applications for finance guarantees for offshore wind supply chain infrastructure projects under the UK Guarantees Scheme	Infrastructure UK	Ongoing
26	Investigate the feasibility of improving the affordability of bonds and guarantees required by supply chain companies by utilising Business Bank support	BIS	2014
27	Facilitate discussion and engagement between the financial services sector and the main energy trade associations (including oil and gas) to enable better understanding of the risks and issues surrounding energy investments offshore	BIS	2013 onwards

38 BIS/DECC (March 2013), *UK Oil and Gas Industrial Strategy: Business and Government Action Plan* <https://www.gov.uk/government/publications/uk-oil-and-gas-industrial-strategy-business-and-government-action-plan>

5. Building a highly skilled workforce

The number of jobs in the offshore wind sector is predicted to grow significantly as the operating capacity and build rate increases, increasing the demand for skilled professionals and trained individuals. Ensuring that the sector has access to a sufficient skilled workforce will be vital to ensure that deployment does not suffer from bottlenecks and that UK workers are able to take advantage of the opportunities on offer. This section sets out the actions that both the Government and industry will take to ensure that the sector is seen as an attractive employment opportunity and that our education system and training programmes deliver the right skills at the right time.

Issue: building a skilled workforce for a growing industry

Offshore wind is a small but growing part of the wider energy sector. It employed around 3,100 FTEs in 2010 having seen a fourfold increase between 2007 and 2010. RenewableUK estimates that this grew to around 4,000 FTEs in 2012.³⁹ The sector employs proportionally more highly skilled workers than the UK average with 47% of the workforce occupying managerial, professional or associate professional roles compared with 40% on average for the UK.⁴⁰

Many of the skills needed, such as high level Science, Technology, Engineering and Maths (STEM) and project management, are common to the wider energy sector. The key skills challenges for the energy sector include:

- meeting the current and future need for engineering and technician skills
- insufficient management skills
- competing for talent in the domestic and global labour market
- an ageing workforce
- reliance on other sectors for skilled workforce

Feedback from industry is that lack of skills is a significant issue for the sector and reported to be most acute in engineering and technician roles, offshore expertise and specific roles such as environmental analysis, lifting and helicopter/boat pilots. The industry also has a high percentage of hard to fill vacancies in managerial, professional and associated professional jobs and must compete directly with other energy industries for the most skilled and experienced employees.

39 RenewableUK (October 2012), *Wind: State of the Industry 2012*, page 17
<http://www.renewableuk.com/en/publications/index.cfm/SOI2012>

40 RenewableUK (2011), *Working for a Green Britain: Employment and Skills in the UK Wind & Marine Industries Vol 1*, <http://www.renewableuk.com/en/publications/reports.cfm/Working-for-a-Green-Britain-Volume-1>

Skills shortages are also likely to be driven by a number of factors unique to the offshore wind sector:

- the perceived lack of certainty in future market demand and growth rate of the industry leads to reluctance to recruit and train inexperienced staff before a contract is awarded, particularly for smaller supply chain companies;
- the need for some niche skills (such as divers and project managers with offshore installation experience);
- lack of awareness of the sector as a career option for new starters and re-trainers.

Future growth in the industry will result in more demand for highly skilled staff. Based on Energy & Utility Skills Ltd *Work Force Planning Model*⁴¹ and *Working for a Green Britain vol2*,⁴² delivering an extremely high growth scenario in offshore wind would result in massive job growth in highly skilled roles:

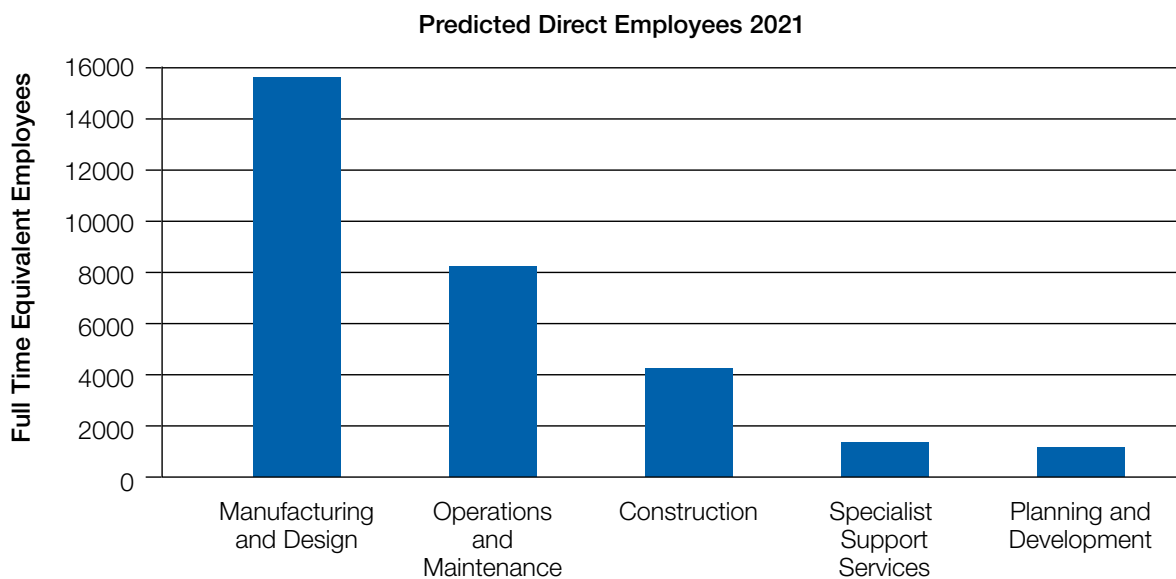


Figure 5 Skills needs of offshore wind industry by 2021, based on the medium scenario of RenewableUK and EU Skills publication *Working for a Green Britain vol2* which estimates that delivering 23GW of offshore wind by 2020 would result in massive job growth in highly skilled roles.⁴³

Action now will ensure that companies have the skilled staff they need in future, support recruitment from the UK labour market and minimise the risk that UK suppliers cannot bid for new contracts because they are unable to recruit.

41 Energy & Utility Skills Ltd is the Sector Skills Council for the gas, power, waste management and water industries.

42 Energy and Utility Skills and Renewable UK (July 2011), *Working for a Green Britain Vol 2*.
<http://www.euskills.co.uk/download.php?id=1319>

43 Ibid.

Action: building a highly skilled workforce

There are a number of Government and industry-led programmes to develop and retain skills, such as the Talent Retention Solution, an industry led initiative to retrain and redeploy engineers, the Talent Bank and the Renewables Training Network. There is also an employer-led National Skills Academy for Power and Government funding for apprenticeships, with additional support for smaller employers.

Skills programmes supported by the Devolved Administrations to develop offshore wind skills include: the Low Carbon Energy and Marine Power Institute in Swansea supported by the Welsh Government; the Energy Skills Challenge Fund, which aims to create an additional 1,000 training places to assist those with transferable skills to fast-track into the energy sector, supported by the Scottish Government; and the development of bespoke training for the offshore energy sector including courses in Marine Civil Engineering, Renewable Energy Engineering and Mechanical and Electrical Manufacturing Engineering at Queens University Belfast and the University of Ulster.

In addition:

- Government will work with industry to raise awareness of existing skills funding and explore whether existing programmes could be tailored to meet the needs of the offshore wind sector.
- The Centres for Offshore Renewable Engineering (COREs) will work at a local level to raise awareness of skills interventions available for businesses in their area and explore how existing interventions could be tailored to address the needs of their local businesses and workforce.
- The sector skills council, Energy & Utility Skills (EU Skills) will work in partnership with employers to support them to recruit and train their workforce, for example using Talent Bank to pool demand and broker collaborative arrangements between employers, enabling them to share the cost and risks of funding training.
- Through the Renewables Training Network, RenewableUK will identify skills required by the offshore wind sector and deliver training to support movement between industries. The forthcoming report by BIS on engineering skills shortages and how to address them will support this work.⁴⁴
- EU Skills will continue to support colleges delivering the City and Guilds Wind Turbine Engineering Apprenticeship in all four nations of the UK. Launched in 2010, the Wind Turbine Engineering Apprenticeship was developed by EU Skills in partnership with Renewable UK, City and Guilds and key employers in the wind industry. EU Skills have added an 'Installation and Commissioning' pathway to the apprenticeship.

⁴⁴ The report, by Professor Perkins, the Chief Scientific Advisor for the Department for Business, Innovation and Skills, will be published in autumn 2013. It will look at whether the UK has sufficient engineering skills and policy interventions to increase the engineering skills base.

- In Scotland, the Energy Skills Action Group (ESAG), reporting to the Scottish Energy Advisory Board, was created to address cross-cutting skills issues and find potential solutions across the energy sector. It will create a skills matrix to support the development of skills solutions for the sector and will refresh the industry-led *Skills Investment Plan for Energy*⁴⁵ during 2013/14 for the future skills demands and job opportunities.
- In Northern Ireland, the Advanced Manufacturing and Engineering Services Working Group has developed a higher skills apprenticeship framework in engineering to meet the needs of the sector in association with the further education colleges including Belfast Metropolitan College who are leading in the provision of specialised manpower for wind turbine operation and maintenance.

Case Study 8: Developing a Programme for Skills Development via the Employer Ownership of Skills pilot

The Employer Ownership of Skills pilot (EOP) provides a route for employers to secure funding to deliver skills requirements matched with private investment. The offshore wind sector was successful in securing funds in round 1 of the EOP via a consortium bid from SMEs based in Harwich. The consortium, led by AJ Woods Engineering, a specialist marine and construction engineering firm, aims to enhance the local skills base in the offshore wind sector. The employers are pooling their expertise and are working together for the first time to develop a programme of skills development, shared work experience and support for new entrants to offshore wind. The project will make the identification and delivery of training much more cost effective for local employers.

Action: making offshore wind a desirable career choice

There are a number of bodies working closely with employers to increase awareness of the sector as a career option. For example, The Crown Estate has launched an offshore wind specific careers resource, project managed by EU Skills and hosted by U-Explore. In addition, EU Skills and the National Skills Academy for Power are working with the Career Advisory Service, the National STEM centre and STEMNET to enhance the guidance for teachers and careers advisors on careers in the broader energy sector, and have launched Green STEM aimed at encouraging learners, employers and education providers to work together towards a low carbon economy.

Modules on the offshore wind industry are rare within vocational education as the sector is still emerging. The EU Skills Wind Specific Provider Forum, consisting of college providers from across the UK, is working with industry to share resources and experience.

45 http://www.skillsdevelopmentscotland.co.uk/media/256998/sds_energysip_final.pdf

In addition:

- The EU Skills higher skills group, consisting of employer and Higher Education partners, will introduce specialised wind units in the ‘Power Masters’ degree programme later this year, developed through collaboration with a number of universities and linking with similar programmes from other STEM sectors.
- RenewableUK will build on its existing careers and educational work to promote understanding of wind energy and awareness of career opportunities, including through RenewableUK’s annual careers event and production of learning and teaching resources for different educational levels. RUK is engaging with higher education and professional institutions to increase understanding of the offshore wind industry and to get more offshore wind specific content in generic engineering courses.
- The Offshore Wind Industry Council will take forward opportunities to raise awareness of career opportunities in the sector, for example through the BIS “See Inside Manufacturing” project which arranges for students to visit behind the scenes of key manufacturing sectors and the STEM Ambassadors programme.

There are good examples of industry working directly with the further education and higher education sectors to ensure that school-leavers and graduates have the right skills. For example, Centrica is engaging with local education providers to enable development of the supply chain skills needed for Round 3 and SSE have partnered with the University of the Highlands and Islands, providing £3 million to develop training and skills in the Highlands. The Champions for Wind scheme run by Forewind works with younger students engaging them in the career opportunities offered by the industry and giving them an understanding of the skills requirements.⁴⁶



Students from Alderman Peel High School, Year 7, give an enthusiastic demonstration of their model wind turbines, to Norman Lamb MP, Cllr Marie Strong, Scira’s Einar Strømsvåg, and their Headmaster Alastair Ogle

Courtesy of Statoil

⁴⁶ <http://www.forewind.co.uk/zone-development/champions-for-wind.html>

No.	Detailed action	Responsible	By when
28	Raise awareness of skills interventions and funding available for the industry and explore whether these could be tailored to meet the needs of the offshore wind sector. Work at a local level to raise awareness of skills interventions and explore how existing interventions could be tailored to address specific needs	BIS/COREs/ industry	2013 onwards
29	Support employers in recruiting and training their workforce, for example using Talent Bank to pool demand and broker collaborative arrangements between employers, enabling them to share the cost and risks of funding training	EU Skills	2013 onwards
30	Identify the skills needed in the offshore wind sector and provide training to support the movement between industries in the wider energy sector and beyond, through the Renewables Training Network	RUK	2013 onwards
31	Support the delivery of apprenticeship programmes, including the Wind Turbine Engineering Apprenticeship across the UK	EU Skills	2013 onwards
32	Develop an industry-led Skills Investment Plan for Energy, to support the development of skills solutions for the energy sector, including the offshore wind sector	ESAG (Scotland)	2014
33	Engage with higher education and professional institutions to include more offshore wind specific content in engineering courses, including introducing specialised wind units in the 'Power Masters' programme	EU Skills and RUK	2013 onwards
34	Raise awareness of career opportunities in the sector, for example through the BIS "See inside Manufacturing" project which arranges for students to visit behind the scenes of key manufacturing sectors and the STEM Ambassadors programme	OWIC/RUK/ EU Skills	2013 onwards

Summary of actions

No.	Detailed action	Responsible	By when
1	Publish further detail on Electricity Market Reform (EMR) implementation, including: <ul style="list-style-type: none"> i. further detail on CfD contract terms ii. final strike prices 	DECC	Aug 13 Dec 13
2	Develop process and criteria for a supply chain plan to be submitted before applying for a Contract for Difference (CfD)	DECC	2013
3	Provide open and realistic build timescales to show 'project pipelines' detailing tendering and contracting decision points to allow the supply chain to align expansion plans to market needs. The data will be published by RenewableUK.	OWIC/RUK/ Scotland Offshore Wind Industry Group (OWIG)	2013 onwards
4	Organise and run regular 'Share Fair' events where supply chain companies can learn about projects and forthcoming opportunities	OWIC/RUK	2013 onwards
5	Provide an assessment of future markets for individual elements of an offshore wind farm, including contracting decision points, through the MAS Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind), with funding from the Regional Growth Fund	MAS, with RUK, AMRC and Grant Thornton	2013- 2016
6	Communicate benefits of offshore renewable energy across Europe and globally (Norstec) and promote local benefits (CORES), with a finalised engagement plan in the Autumn	Norstec and CORES	Autumn 2013 onwards
7	Deliver the MAS Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind), supported by £19.9m from the Regional Growth Fund	MAS, with RUK, AMRC and Grant Thornton	2013- 2016

No.	Detailed action	Responsible	By when
8	Ensure companies investing in the sector in England understand and can access the support on offer locally	COREs	2013 onwards
9	Establish a new Offshore Wind Investment Organisation to deliver inward investment into the UK	UKTI	Autumn 2013
10	Explore contracting models and approaches, including approaches to increasing collaboration, framework agreements between developers and suppliers, and approaches to facilitating new entrants to the market	OWPB	2013 onwards
11	Undertake a supply chain gap analysis, supplemented by a complementary high level assessment of the UK supply chain capability	The Crown Estate/BIS	Autumn 2013
12	Promote export opportunities through the High Value Opportunities Programme, promotion of strategic collaborations and practical support to companies	UKTI and SDI	2013 onwards
13	Expand the scope of the offshore wind manufacturing funding scheme for England	DECC	2013
14	Measure and share information on UK content in offshore wind developments for both CAPEX and OPEX, using the methodology being developed by the OWPB, and review progress on increasing UK content	OWIC (developers)/OWPB	2013 onwards
15	Promote knowledge sharing with the oil and gas sector, including through joint liaison officers in the trade associations to foster closer ties	RenewableUK/Oil & Gas UK/OWPB	2013 onwards
16	Publish a Low Carbon Innovation Strategy setting out the Government's vision for low carbon innovation support, including offshore wind, to the end of the decade	LCICG	Late 2013
17	Provide £46.1m of funding for the new Offshore Renewable Energy (ORE) Catapult to galvanise all UK innovation work streams and test assets	Technology Strategy Board	2013-2018

No.	Detailed action	Responsible	By when
18	Build on the work by the Offshore Wind Accelerator and continue to work to bring forward the development of offshore wind testing facilities in the UK	Government, developers and manufacturers	2013 onwards
19	Deliver a test and demonstration leasing programme to facilitate successful demonstration of technology breakthroughs, through extensions to existing sites, new sites and non-grid connected sites and implementation of improved contracting to help lower costs	The Crown Estate	2013 onwards
20	Launch a Cost Reduction Monitoring Framework, designed to track progress in achieving levelised cost reductions and share best practice	The Crown Estate	2014
21	Explore options to streamline the consenting process for testing and demonstration of offshore technologies	The Marine Management Organisation, The Crown Estate and partners	2013
22	Progress a suitable test and demonstration site in the Highlands and Islands for technology from 2016 onwards	Scottish Enterprise and Highlands & Islands Enterprise	From 2016
23	Look to invest over £1 billion in offshore wind, co-investing in projects with commercial parties	Green Investment Bank	Ongoing
24	Address gaps in the supply of finance to small and mid-sized companies through current schemes and the new Business Bank	BIS	Fully operational 2014
25	Consider applications for finance guarantees for offshore wind supply chain infrastructure projects under the UK Guarantees Scheme	Infrastructure UK	Ongoing

No.	Detailed action	Responsible	By when
26	Investigate the feasibility of improving the affordability of bonds and guarantees required by supply chain companies by utilising Business Bank support	BIS	2014
27	Facilitate discussion and engagement between the financial services sector and the main energy trade associations (including oil and gas) to enable better understanding of the risks and issues surrounding energy investments offshore	BIS	2013 onwards
28	Raise awareness of skills interventions and funding available for the industry and explore whether these could be tailored to meet the needs of the offshore wind sector. Work at a local level to raise awareness of skills interventions and explore how existing interventions could be tailored to address specific needs (COREs).	BIS/COREs/ industry	2013 onwards
29	Support employers in recruiting and training their workforce, for example using Talent Bank to pool demand and broker collaborative arrangements between employers, enabling them to share the cost and risks of funding training.	EU Skills	2013 onwards
30	Identify the skills needed in the offshore wind sector and provide training to support the movement between industries in the wider energy sector and beyond, through the Renewables Training Network	RUK	2013 onwards
31	Support the delivery of apprenticeship programmes, including the Wind Turbine Engineering Apprenticeship across the UK	EU Skills	2013 onwards
32	Develop an industry-led Skills Investment Plan for Energy, to support the development of skills solutions for the energy sector, including the offshore wind sector	ESAG (Scotland)	2014

No.	Detailed action	Responsible	By when
33	Engage with higher education and professional institutions to include more offshore wind specific content in engineering courses, including introducing specialised wind units in the 'Power Masters' programme	EU Skills and RUK	2013 onwards
34	Raise awareness of career opportunities in the sector, for example through the BIS "See inside Manufacturing" project which arranges for students to visit behind the scenes of key manufacturing sectors and the STEM Ambassadors programme	OWIC/RUK/ EU Skills	2013 onwards

Measuring success

The success of the strategy will be tracked through a number of measures. Proposed measures are set out below. The Government will determine the sources of data to be used to monitor progress against these success measures. In some cases it may be more practical to measure interim outputs, in place of short and medium term outcomes and long term impact.

Overall

UK turnover for sector, including exports

Number of jobs in sector

UK rated top location to invest

Providing market confidence and demand visibility

Improved awareness of future business opportunities

Increased business activity due to greater demand certainty

Building a competitive supply chain

Improved awareness of UK capabilities

Increased inward investment into the UK by foreign-owned offshore wind supply chain companies

Increased exports by UK-based companies and contracts with foreign companies

Increased UK content in UK offshore wind sites, in both capital and operating expenditure

Supporting innovation

More test sites and increased uptake of testing facilities

Development of new technologies

Increased use of technology developed by UK-based companies

Reduced cost of offshore wind

Finance

Increased availability of affordable finance options

Building a highly skilled workforce

Increased awareness of career opportunities

Fewer key vacancies

Annex A: Legislative framework for renewable energy

The strength of the UK's commitment to renewable energy, and specifically in this strategy, offshore wind, is both demonstrated and underpinned by robust legislative foundations. EU and UK regulations have created a framework of obligations and targets to steer a clear and consistent path towards greater use of renewable energy, including offshore wind.

The UK's **Climate Change Act 2008** (2008 Act) is a landmark piece of legislation – the world's first. That Act created a legally binding target for the UK to reduce greenhouse gas emissions by at least 34% by 2020, and at least 80% by 2050, taking 1990 as the base year.

The **UK's Promotion of the Use of Energy from Renewable Sources Regulations 2011** enshrines the EU Renewables Directive target of 15% of UK energy to come from renewable sources by 2020, which translates into about 30% of total electricity needs. That target derives from both the 2008 Act and the 2009 EU Renewable Energy Directive.⁴⁷

The trajectory of these reductions is clearly set out in the UK **carbon budgets** that have been set out in law in accordance with the provisions of the 2008 Act, and which provide the certainty businesses need for making long-term investment decisions – offshore wind is expected to make a significant contribution to meeting these targets.

The **Fourth UK Carbon Budget**, covering 2023-2027, is a milestone along a consistent pathway towards 2050, and legally commits the UK to a 50% reduction in emissions compared to 1990 levels over the period, further reinforcing the framework for the development of low carbon technologies such as offshore wind – a point also emphasized in the UK's Carbon Plan.⁴⁸ The target for the fourth carbon budget was set on the basis of an increased EU ambition of 30% by 2020, which is due to be reviewed in 2014.

In addition to existing legislation, **the new Energy Bill** was introduced to the UK Parliament on the 29th November 2012 and is anticipated to become law in 2013. The Bill will put in place a regime that is expected to endure for many decades to come, providing solid foundations for long-term investments. Its key features, which

47 <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:en:PDF>

48 http://www.decc.gov.uk/en/content/cms/tackling/carbon_plan/

have been developed during the Electricity Market Reform programme, aim to provide investors with transparency, longevity and certainty about the UK energy market and the opportunities for renewable energy sources such as offshore wind.⁴⁹

In order to prevent an investment hiatus over the transition from the Renewable Obligation regime to the new regime under the Energy Bill, the Government is actively working with offshore wind developers to **enable early investment decisions to progress** to timetable, and is in discussions with them to identify forms of reassurance that might be given to support their investment decisions.

In parallel, the **Enterprise and Regulatory Reform Bill** has established the new **Green Investment Bank** in order to provide a new source of capital for green infrastructure projects. This new institution is operating with initial funding of £3bn, which will help leverage funding for investments from other sources. Reflecting the importance the Government attaches to the sector, offshore wind is one of the key strategic priority sectors for the Bank. The establishment of this new Bank during the current recession, and with an appreciable level of initial capitalisation at a time of public sector reductions in spending, is a significant demonstration of the UK's long-term commitment to renewable energy, and offshore wind in particular.

A further legislative basis supportive of the drive towards greater use of offshore wind in the UK is the **EU Emissions Trading Scheme**, delivered nationally through the Carbon Price Floor, which will increase from £16 per tonne now to £30 per tonne in 2020 and £70 per tonne in 2030, and will support the move to a low carbon economy.

49 <http://www.decc.gov.uk/en/content/cms/legislation/energybill2012/>

Annex B: Summary of key supply chain elements

Existing Capability in the UK Supply Chain and Future Opportunities

The UK has capability that could be realised in all aspects of the supply chain through investment. Many companies have identified future investments in the sector, often to introduce innovations recognising the importance of cost reduction. This annex discusses the UK supply chain, gives examples of UK supply, and discusses changes in technology that could impact this supply.

Development Services

1. Teams based in the UK, working for developers, manage this process drawing in expertise where required. This activity has high UK content. Examples of UK supply include The Gardline Group which provides survey and site investigation vessels and services to many UK offshore wind projects and Fugro UK, Cathie Associates and Coastline Surveys which have supplied geoscience, survey and geotechnical related services, and ESS and APEM have provided environmental surveying for birds. The UK supply chain for meteorology and oceanology masts includes design (RADTech), lattice manufacture (Lynx), foundations (Mabey Bridge, TAG, Steel Engineering, Harland & Wolff) and installation (Fugro Seacore, MPI Offshore, Seajacks).

Turbines

2. The European offshore turbine industry mostly grew out of the German and Danish onshore wind markets. It is currently dominated by manufacturers based on the Continent (principally Siemens, Vestas, REpower and Areva) which mainly use a continental supply chain. The UK has part of this wider supply chain, where market leaders and established suppliers include GE Power Conversion (5GW/year of onshore and offshore converters, generators, power quality SCADA and grid connection solutions from its UK facilities in Rugby and Kidsgrove), Gurit (blade materials), BGB (slip rings), Cooper and Turner (large fasteners), PPG (glass fibre), Roballo (slewing rings), HV Wooding (engineered components for electrical systems), James Walker (Tension Control systems), Latchways (fall arrest systems), MOOG UK (slip rings, strain and stress measurement and test

equipment, fibre optic rotary couplings, fluid rotary unions) and Nylacast (engineering plastic components).

3. Recently a new generation of dedicated offshore wind turbines has been developed, with larger diameter rotors and higher rated capacities. Deployment of these has already started, initially at onshore and offshore demonstration projects and more recently in commercial projects. The first of these offshore-specific turbines have had rated capacities in the range 5MW to 6MW but there is now an increasing focus on turbines rated between 6MW and 8MW as these are expected to enable significantly lower costs of energy through lower balance of plant, installation and O&M costs. The cost of energy is estimated to be over 8% lower for a 6MW turbine than for 4MW turbine even though the turbine itself becomes more expensive per MW.⁵⁰ It is anticipated that by the time the current “new generation” turbines are proven, technology advances will have enabled a new generation of even larger turbines able to further reduce the cost of energy. The increased scale of turbines will necessitate more waterside manufacturing so could present opportunities for UK waterside manufacturing sites.
4. David Brown Gear Systems is a designer, developer and manufacturer of gearboxes, including supplying Samsung Heavy Industries new generation 7MW offshore wind turbine. Two prototype nacelles are due to start their testing in summer 2013: in a full turbine at the Methil near-shore test pad, and in a full nacelle that will undergo accelerated life testing at the 15MW capacity Wind Turbine Drive Train Test Facility at Narec.
5. The drivetrain within the nacelle conventionally uses either a gearbox and generator or a direct-drive generator. Artemis Intelligent Power, acquired by Mitsubishi Power Systems Europe in 2010, has developed a third kind of drivetrain, based on its Digital Displacement (R) hydraulic technology. For the first time in a large wind turbine, this will enable the use of conventional wound-rotor synchronous generators connected directly to the network. Artemis and Mitsubishi have now scaled their power-train technology up from a 1.6MW lab system, and a wind turbine retrofit at 2.4MW, to a 7MW offshore version which has been rig tested and will be erected in a prototype 7MW SeaAngel wind turbine at SSE’s Hunterston demonstration site in autumn 2013.
6. Romax is the world’s leading independent designer of wind turbine drivetrains and gearboxes, having developed 29 designs ranging in capacity from 750 kW to 6 MW plus. It has also developed an extensive range of turbine performance and condition monitoring software tools and services.
7. GL Garrad Hassan is the world’s largest wind consultancy and has provided independent technical and engineering services, products, and training courses.

⁵⁰ *Offshore wind cost reduction pathways*

This has included wind resource assessment, energy yield prediction, wind turbine design and associated engineering software.

8. Continued innovation is required, principally to drive down build costs but also to achieve greater reliability and increased energy capture. Advances in material science for example will allow longer blades, which although will increase turbine cost per MW, will enable cost reductions elsewhere and greater energy production per MW, thus reducing cost of energy. Fewer larger turbines are required to give the same generating capacity and while the absolute cost of foundations, cables, installation and operations and maintenance is greater per turbine, and their total cost per MW is lower.

Foundations

9. To date, more than three quarters of all installed European offshore wind projects have used steel monopile foundations, with most of the rest using concrete gravity base designs at shallow wind farms. Larger turbines and deeper waters are driving the increased use of jacket foundations although alternative designs such as super-size monopiles and concrete foundations (Vinci, Gravitass) are being considered.
10. Most foundations are fabricated in Continental Europe although the UK based company BiFab is a leader in jacket foundation supply having supplied the turbine foundations for the Beatrice and Alpha Ventus demonstration projects and the Ormonde wind farm, as well as supplying the substation jacket foundations for Gwynt Y Mor. TAG Energy has been awarded a contract to manufacture 16 monopiles and transition pieces for E.ON's Humber Gateway. MTL provided boat landing systems on the Ormonde Project as a subcontractor to BiFab and to Weserwind for German projects.
11. The cross over from oil and gas structures places the UK in an ideal position to capitalise on the need for greater number of jacket foundations. In addition there are a number of differing technologies (gravity, suction bucket) which, due to the size and weight, are more cost effective if manufactured locally.
12. Innovative foundation solutions will need to be successfully demonstrated in an offshore environment before developers have the confidence in their large scale deployment. The innovation driver for foundations is reduced cost per MW. Currently there are a number of promising foundation technologies and innovative manufacturing methods that could deliver cost savings if demonstrations prove them 'fit for purpose' for offshore wind and capable of serial production. Opportunities also exist for improving the installation methods from a time, cost and safety perspective.

Electrical infrastructure

13. All offshore wind projects over 100MW completed to date have incorporated at least one offshore high voltage alternating current (HVAC) substation and a new, or extended, onshore substation.
14. Electrical infrastructure provision is dominated by four large companies: Siemens, ABB, CG Power, and Alstom Grid. All have design expertise in the UK.
15. Siemens opened the Siemens Renewable Energy Engineering centre, Manchester, in 2012 and has created 200 new jobs in the last 2 years and also opened the Siemens Customer Support Centre, Newcastle, in 2013 where it is training 90 apprentices.
16. At its centre in Stafford, Alstom manufactures large power transformers, relay protection & control systems and high voltage direct current (HVDC) valve and control systems, and is developing the next generation of HVDC technology to meet demand for future offshore wind farm projects. The Stafford Centre has delivered onshore and offshore transmission connections for recent UK projects such as Sheringham Shoal and Ormonde, as well as German projects Alpha Ventus, Borkum West II and Global Tech I. The facility is expanding with the award of German offshore wind project Dolwin 3 (a large 900MW HVDC connection), leading to more jobs and investment in the local supply chain.
17. GE Power Conversion is developing a DC architecture including a DC power converter for offshore wind farms.
18. Prysmian Cables Ltd manufactures high voltage onshore cables from its Wrexham facility and cables accessories from its main UK location in Hampshire which have been used for the UK onshore cable routes associated with offshore wind farm transmission.
19. Harland & Wolff undertakes marine design and construction of substations, monopiles and transition pieces. It has a Universal Foundation design that combines a monopile with a suction bucket. Its main focus is currently on the manufacture of transformer platforms and turbine foundations (primarily jackets). The company supplied the transformer platform to Siemens for the Gwynt Y Môr wind farm.
20. Heerema manufactures and fabricates substations topsides and projects have included Sheringham Shoal for Areva T&D (now Alstom Grid) and Greater Gabbard (Siemens Transmission and Distribution).
21. Many UK companies have been involved in design and supply of onshore substations such as Jones Bros Ltd Civil Engineering UK who worked on the onshore substation for Gwynt y Môr and SLP who designed and built the Thanet substation.

22. The development of higher voltage array cabling will reduce transmission losses and enable more turbines to be included on a “string” that is connected in a row. Improved array layout will reduce the cabling requirements for a wind farm, and therefore cost. In the longer term, improvements may result from centralising the power conversion technology to the substation rather than the turbine and/or introducing DC turbines which removes the need for most of the converters. Further cost reductions may come from reducing the need for as many separate substations by locating more of the remaining electrical infrastructure at selected turbines that act as mini collector substations collecting the output from adjacent turbines.

Subsea cables

23. Subsea cable supply is split into supply of medium voltage and high voltage cables. There are a number of facilities located in Scandinavia due to their historic demand for interconnectors. In the UK, JDR Cables is a significant array cable producer investing in a deepwater quayside production facility in Hartlepool. It has developed high voltage export cable manufacturing capability and doubled its Hartlepool facility’s footprint. It has supplied array cables to Greater Gabbard, London Array and the German Meerwind projects and an export cable to Gunfleet Sands III.
24. Tekmar Energy has recently developed a new Teklink cable protection system which avoids the need for a j-tube and utilises a remote installation method with no handling in a diver-less operation. Tekmar Energy has successfully delivered solutions into large offshore wind farm projects including Alpha Ventus and Bard (with NSW) and Gjoa (with ABB). Pipeline Engineering supplied the subsea cables protection system for London Array.
25. Innovation opportunities are expected to emerge from moving to using higher voltage ratings, HVDC links, using medium-voltage DC in arrays, improving installation methodology and cable protection.

Installation

26. Early offshore wind turbines and foundations were installed using general purpose offshore construction vessels, originally built for the oil and gas sector and other offshore markets. While these vessels were able to install turbines, they had limited capacity and, as the market developed, purpose-built vessels were constructed. The UK now has a growing specialist fleet that provides services Europe wide.
27. Installation contractors are a combination of specialist offshore wind vessel operators and those that have diversified from other marine sectors where the UK has traditionally had a strong industry. There is a mixture of UK and global supply reflecting the global nature of the vessel supply industry.

28. In 2012, Prysmian acquired the UK-based subsea cable installation company Global Marine Energy, which has delivered cable installation works at a number of wind farms including London Array, Horns Rev 1 and 2, Lincs and Thornton Bank.
29. Harland & Wolff entered the offshore wind market in 1997 designing vessels to be used for the installation of wind farms and it is active in the repair and maintenance of offshore wind installation vessels.
30. Houlder Limited has designed vessels including the concept development of an O&M Mothership, and is the design partner for the Gaoh Offshore's Deepwater Installer as well as designing the Houlder Turbine Access System (TAS) for the wind farm personnel transfer.
31. DeepOcean has provided survey, trenching and installation services to offshore wind farms including Bard 1, Walney, Greater Gabbard and Jeju.
32. Reef Subsea Dredging & Excavation worked on Greater Gabbard excavating approximately 100 monopiles around the j-tube approach to enable cable entry, lowering of inter-array cables, and burial of circa 80 cable approaches to the monopiles using their non-contact excavation tools.
33. Reef Subsea Power & Umbilical installed and buried 14 inter array cables for the Lincs wind farm using its Q1000 Trenching ROV launched in 2012.
34. MPI Offshore pioneered the development of specialist offshore wind vessels when it commissioned the MPI Resolution. The vessel has gone on to install turbines and foundations at a number of UK offshore wind farms, including Gunfleet Sands, Lynn and Inner Dowsing, Lincs and Thanet. In 2012, the company brought two larger offshore wind installation vessels into service that have been used at London Array, the world's largest offshore wind farm. MPI Offshore also operates workboats used for the transfer of equipment and personnel to and from wind farm sites.
35. Seajacks owns and operates three self-propelled installation vessels, Leviathan a. In 2012 it ordered a new self-propelled jack-up vessel Hydra, specifically designed for offshore wind and oil and gas installation and maintenance services, with an expected delivery date in 2014. In June 2013 it announced an order for another new self-propelled jack-up Scylla from Samsung Heavy Industries.
36. The UK is world leader in remotely operated vehicle supply. SMD, Saab Seaeye and Forum Energy manufacture remotely operated vehicles (ROVs) and cable ploughs.
37. IHC Engineering Business Ltd is a UK supplier of cable carousels.
38. Cammell Laird Shiprepairers and Shipbuilders Limited lengthened by 12.5 metres the dedicated cable laying ship C/S Nexans Skagerrak to increase its cable handling capabilities.

39. Technip acquired all the assets of the subsea cable installation company Subocean Group in 2011 and undertakes offshore wind subsea cable-laying and other subsea engineering and management services. Technip has a wider interest in offshore wind through its involvement in the Hywind and Vertiwind floating offshore wind projects and is a development consortium partner in EOWDC.
40. Mobilising vessels for offshore wind is also undertaken in the UK including the 100T blade racks constructed and fitted by A&P Group in Falmouth Harbour to Seajacks' Kraken and Leviathan self-propelled jack-up vessels used to install Walney. MC Ware have undertaken mobilisation for cable vessels and for MPI's Resolution.
41. Innovations in installation, operation and maintenance, and health and safety are expected to yield further improvements in the cost of energy. Expected changes include reducing sensitivity of blade installation to high winds, greater onshore commissioning (seen with the V112 at Karehamn) and integrated turbine and foundation installation. In addition, development of higher efficiency installation vessels and 'float out and sink' concepts have the potential to reduce costs.

Boats and access systems

42. Access to turbine is generally achieved from workboats and the UK has a thriving industry building these, including Alicat Workboats which acquired South Boats in 2012 and Alnmaritec which is the market leader in the manufacture of aluminium support vessels for the offshore wind industry. CTruk has supplied multi-purpose composite marine craft offshore wind support vessels and grown to a staff of 150 in three years. Other boat builders include Blyth Workcats, Buckie Shipyard and Dunston Shipbuilders.
43. OSBIT Power's MaXccess-T12 systems have been operating at SSE and RWE's Greater Gabbard site since August 2012 and Scira's Sheringham Shoal site since January 2013. Its new Maxess18 access system has just been deployed on Dong Energy and SSE's Walney Offshore Wind Farm.
44. Improved access in difficult sea states and weather conditions and with improved levels of safety is being developed in the UK to move away from the "bump and jump" where the work boat is driven against the foundation, allowing the technician to transfer on to the ladder and climb quickly to avoid the workboat moving up in a swell.

Operations, Maintenance and Service (OMS)

45. A high proportion of UK wind farm operation expenditure is spent in the UK and any significant increase in this proportion will only come from increased UK content in capital expenditure. Significant new jobs have been created in operation and maintenance bases such as Barrow, Grimsby, Lowestoft, Mostyn, Ramsgate and Workington.

46. Experience gained in OMS by the many UK companies involved is a UK export opportunity. For example Searoc's Seaplanner software designed specifically for the offshore industry has been utilised on nearly 4GW of offshore wind projects across Europe.
47. With the exception of major component replacement, the large proportion of turbine maintenance is undertaken using shore to turbine personnel transfer vessels. This is likely to change for the Round 3 wind farms which are further from shore, where the increased time it takes to transfer personnel from shore to turbine will lead to more helicopter use and staff based offshore. This might be achieved by, for example, manned substations, Motherships (accommodation ships with a helicopter pad) possibly served by daughter vessels, and Flotels (accommodation ships accessed by boat more likely to be used in construction).
48. For innovation and cost reduction, the primary focus is on reliability of the wind farm itself, decreasing the need to visit the turbine and substation. The secondary focus is to improve the ability to access the wind farm in higher wave heights and more difficult weather conditions to reduce waiting on weather losses and so lower the cost of energy.

Annex C: SWOT analysis for offshore wind

A summary of key findings from the analysis undertaken by BIS and evidence gathered by stakeholders on the performance and competitiveness of the UK offshore wind sector. Key strengths, weaknesses, opportunities and threats are highlighted below although this is not exhaustive.

STRENGTHS	WEAKNESSES
<p>LARGE WIND RESOURCE AND FAVOURABLE LOCATIONS with substantial potential for export of power</p> <p>EXPERTISE IN OFFSHORE engineering, platform deployment, and marine operations transferable to offshore wind</p> <p>STRONG R&D CAPABILITY in renewables with increasing competence in demonstration and early deployment</p> <p>LARGEST INSTALLED CAPACITY with UK being world leader</p> <p>EXPERTISE IN ADVANCED MANUFACTURING & MATERIALS applicable to offshore wind</p> <p>REGULATORY AND PRICE SUPPORT FRAMEWORK enabling deployment of low-carbon energy generating technologies, including offshore wind, with cross party support</p>	<p>TESTING AND TECHNOLOGY DEPLOYMENT is low which hinders the move to larger turbines and fully utilising UK's R&D capability</p> <p>HIGH ENERGY COST of offshore wind in comparison with other renewable energy sources</p> <p>FOREIGN INVESTMENT is limited to date as overseas investors are often unaware of benefits of investing or locating their activities in the UK</p> <p>INDUSTRY COLLABORATION AND SME activity is often limited</p> <p>LOW INVOLVEMENT OF UK SUPPLY CHAIN as it is estimated only 30% of content in UK offshore wind sites on average is sourced from UK suppliers</p> <p>WATERSIDE MANUFACTURING INFRASTRUCTURE insufficient to fully meet sector's needs and new investment is not materialising</p>
<p>LARGE ECONOMIC BENEFITS – by 2020 offshore wind could deliver up to £7bn GVA (excluding exports) and boost total UK jobs by over 30,000 FTE</p> <p>GROWING DEMAND FOR RENEWABLE ENERGY to meet climate change targets, security of supply and increasing demand for energy, both domestically and abroad</p> <p>OFFSHORE WIND COST REDUCTION VIA TECHNOLOGY, SUPPLY CHAIN and FINANCE. The Crown Estate cost reduction pathways study (2012) showed that 28% reduction in levelised costs to £100/MWh (2011 prices) was achievable for 2020. TINA study (2012) estimated that levelised costs of offshore wind energy could go down by 60% by 2050</p> <p>SYNERGIES WITH OTHER INDUSTRIES could be realised as offshore wind relies on products and services from other sectors e.g. professional services, manufacturing and transport</p>	<p>HIGH COMPETITION FOR THE LOCATION OF TOP TIER SUPPLY CHAIN COMPANIES given turbines, foundations, and electrical components can be manufactured from many locations on the North Sea coast line</p> <p>ACCESS TO FINANCE could affect speed of deployment and ability of UK supply chains to scale up quickly due to perceived risks by financiers</p> <p>COST OF ENERGY may not reduce significantly if build rates are low</p> <p>AVAILABILITY OF HIGHLY SKILLED WORKFORCE – offshore wind, like the wider energy industry, faces engineering and managerial skills gaps, competition for talent and ageing workforce</p> <p>HIGH MARKET CONCENTRATION & LACK OF VARIED COMPETITION in the supply chain – over 90% of turbines are supplied by two manufacturers but no turbine manufacturers currently located in the UK</p>
OPPORTUNITIES	THREATS

Glossary of terms

AMI	Advanced Manufacturing Institute
AMRC	Advanced Manufacturing Research Centre
AMSCI	Advanced Manufacturing Supply Chain Initiative
BIS	Department for Business, Innovation & Skills
BFP	Business Finance Partnership
CAPEX	Capital Expenditure
CCS	Carbon Capture and Storage
COE	Cost of Energy
COREs	Centres for Offshore Renewable Engineering
CFD	Contracts for Difference (part of the EMR programme)
CRKN	Cost Reduction Knowledge Network (The Crown Estate)
CRTF	Cost Reduction Taskforce
CT	Carbon Trust
DECC	Department of Energy & Climate Change
EMR	Electricity Market Reform
E.ON	Energy company
EOP	Employer Ownership of Skills pilot
ESAG	Energy Skills Action Group in Scotland
ETI	Energy Technologies Institute
EU SKILLS	Energy & Utility Skills
FID	Final Investment Decision
FIDe	Final Investment Decision Enabling (part of the EMR programme)
FTEs	Full time equivalents
GIB	Green Investment Bank
GROW	Offshore Wind Supply Chain Growth Programme
GVA	Gross Value Added
GW	Gigawatt
HMT	Her Majesty's Treasury

HVO	High Value Opportunities
ITT	Invitation to Tender
IUK	Infrastructure UK (part of HMT)
LCOE	Levelised Cost of Energy
LCICG	Low Carbon Innovation Co-ordination Group
LCF	Levy Control Framework
LEPs	Local Enterprise Partnerships
MAS	Manufacturing Advisory Service
MOU	Memorandum of Understanding
MW	Megawatt
NAREC	National Renewable Energy Centre
NORSTEC	Government/industry partnership to exploit Europe's Northern Seas renewable energy resources
O&M	Operations and Maintenance
OEM	Original Equipment Manufacture
Offshore wind developers	Companies that are developing offshore wind farms
Offshore wind industry	Any business involved in supplying the offshore wind sector including supply chain and developers
Offshore wind sector	A wide term to include any aspect of offshore wind including generation, development and supply
Offshore wind supply chain	Companies that make or supply an element, component or service for an offshore wind farm, during its development, build or operation and maintenance
OMS	Operations, Maintenance and Service
OPEX	Operational Expenditure
ORE Catapult	Offshore Renewable Energy Catapult
OWA	Offshore Wind Accelerator (Carbon Trust)
OWDF	Offshore Wind Developers Forum
OWIC	Offshore Wind Industry Council
OWIG	Offshore Wind Industry Group in Scotland
OWIO	Offshore Wind Investment Organisation
OWPB	Offshore Wind Programme Board
PILOT	Joint UK Government and Industry oil and gas taskforce
RGF	Regional Growth Fund
R&D	Research and Development
RO	Renewables Obligation
RWE	Energy company

RUK	RenewableUK – the main industry body
SDI	Scottish Development International
SE	Scottish Enterprise
SME	Small & Medium Sized Enterprises
SSE	Energy company
STEM	Science, Technology, Engineering and Maths
STEMNET	Science, Technology, Engineering and Maths Network
TINAs	Technology Innovation Needs Assessments
TSB	Technology Strategy Board
UKTI	UK Trade and Investment

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