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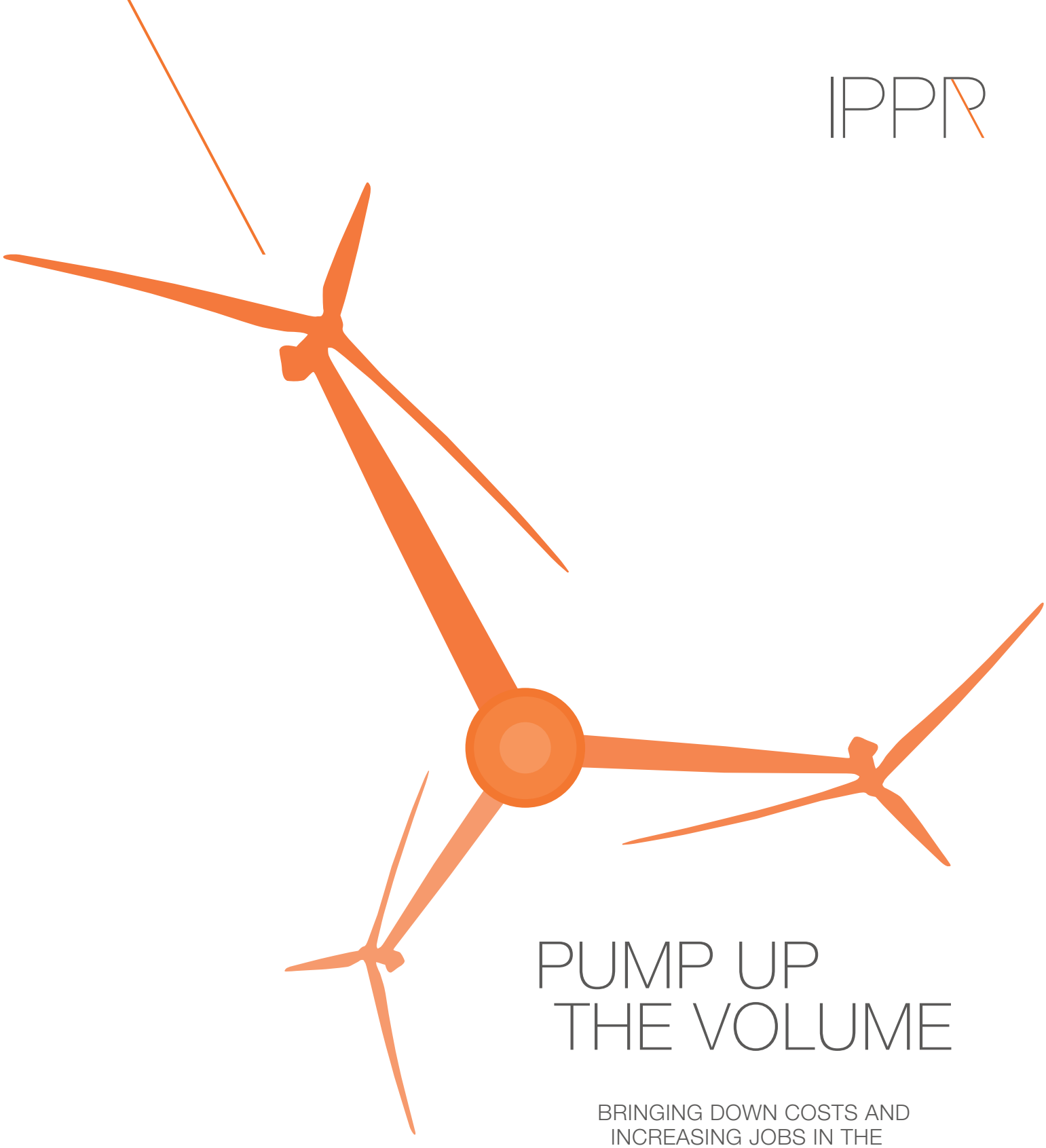

PUMP UP THE VOLUME

BRINGING DOWN COSTS AND INCREASING JOBS IN THE OFFSHORE WIND SECTOR

REPORT

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EXECUTIVE SUMMARY

Around the world, an energy transformation is taking place. New sources of low-carbon power are coming on stream as countries seek to lower their greenhouse gas emissions, reduce pollution levels, enhance security of supply, and create jobs in new industries. The UK is no different, and a broad consensus in favour of this transformation has emerged with the passage of the Climate Change Act 2008, which set an ambition to reduce emissions by 80 per cent from 1990 levels by 2050.

The current and previous governments have both set out a role for offshore wind in the UK's energy mix. The sector presents three key opportunities for the UK. First, the manufacturing potential is significant and will create jobs in both the construction and operational phases. Second, this process contributes to the regional rebalancing of the UK economy. Many of the new jobs are in former industrial heartlands in the north, and the UK's balance of payments is improved as we reduce our reliance on imported fossil fuels and increase our export potential for other offshore wind markets. Third, as a windy island set in shallow waters, Britain has a natural advantage in developing this technology which other countries do not enjoy.

There are, however, two significant challenges. First, offshore wind is currently more expensive than other low-carbon technologies such as onshore wind and nuclear. Second, British workers only produce around a third of the components in the supply chain. This means that many of the jobs generated by the new developments are based overseas – primarily in Denmark and Germany, where the turbines are made.

These two challenges have contributed to a fierce debate within government – especially between the Department of Energy and Climate Change (DECC) and HM Treasury – over the level of certainty that can be given to the industry. The deal struck last year by the Coalition on funding for the Levy Control Framework, and the subsidy levels for different technologies announced in June, have been broadly welcomed by the sector. Crucially, however, no commitment to increase ambition beyond 2020 has been provided.

Exacerbating this is confusion over the government's ambition up to 2020. DECC clearly stated in the 2011 *UK Renewable Energy Roadmap* that 'up to 18GW of offshore wind could be deployed by 2020 ... with over 40GW possible by 2030.' In June they appeared to change their ambition by announcing that the subsidy regime would allow for just 8–16GW by 2020. But DECC's 'central scenario', published last October, sets out a much less ambitious path, leading to just 11.5GW by 2020 and 16GW by 2030. The Committee on Climate Change, which advises the government, believes that this latter scenario 'would imply unacceptable costs and risks of achieving the 2050 [decarbonisation] target'. Both developers and suppliers are, understandably, concerned.

The uncertainty has a direct impact on the numbers of domestic jobs that the sector can generate. Our analysis concludes that the number of jobs per MW increases with scale (as the supply chain is crowded in and export potential increases). At a level of around 18GW of capacity by 2020, the UK could generate up to 15,000 additional jobs compared to DECC's central scenario.

Britain already has strengths in many parts of the offshore wind supply chain including foundation manufacturing, electrical equipment supplies, component makers for grid connection, and professional services. But the value of these elements of the supply chain is dwarfed by that of the turbines, which make up around 50 per cent of the capital costs and are not produced in the UK. Turbine manufacturers are clear that greater clarity both up to and beyond 2020 are necessary for them to establish a base in the UK.

Britain is not alone in facing these challenges and can learn much from other countries. Denmark is an 'early adopter' which enjoys a strong manufacturing base in offshore wind, having supported the wind industry since the late 1970s – ironically, using British technology. Germany, already Europe's leading market for onshore wind, has thrown its full political weight behind the offshore wind industry as a means of plugging the gap left by its decision to abandon nuclear energy. France has grabbed the economic opportunity this new industry presents to create domestic jobs, long before the foundations for a single offshore turbine have been laid.

The UK's current policy trajectory could see it achieving a 'worst of all worlds' outcome: low volume, high cost, and a low share of manufacturing activity from domestic suppliers. This would fail our climate challenge, our jobs challenge, and our rebalancing challenge.

An alternative pathway is possible, if the government can bring together an industrial strategy for the sector predicated on a combination of 'carrots and sticks'. The industry should be given the clarity that it needs and which has been provided in other countries. A 2030 target for the carbon intensity of, or share of renewables in, the power sector is therefore a necessary condition. Developers should be provided long-term contracts of 20–25 years. To address the legitimate concerns around expense, developers must be expected to drive down costs to make offshore wind competitive with other technologies.

A greater level of certainty and ambition out to 2030 should also encourage more suppliers to move to the UK, but this cannot be guaranteed. The allocation process and the terms of the government's 'contract for difference' subsidy scheme must require the industry to bring 'socioeconomic value', such as jobs and skills development, to the communities in which they operate and show how that value enhances the success of the proposed project. Ministers should actively pursue foreign investment in the UK while keeping within WTO rules on local content and EU rules on state aid.

The UK's critical infrastructure, particularly our ports, needs to be upgraded to provide construction and assembly facilities for the supply chain. Without policy certainty there is a risk that privately owned ports will not adapt. As well as providing certainty beyond 2020, ministers should play an active role in encouraging port owners to modify their facilities. Meanwhile, in relation to the grid, the lack of a costing of risk allocation between the developers and the transmission operators could result in offshore wind being more expensive than it needs to be.

Finally, existing collaboration between industry and government on innovation and skills needs to be enhanced. Funding for innovation, which is critical to bringing down costs and creating intellectual property, is spread across a range of organisations with little coordination. More strategic targeting of existing government support for innovation could help direct significantly more resources to the recently created offshore renewable energy 'Catapult' centre. Both government and industry need to create a strategic plan for skills development. The industry should sponsor students aged 14–19 at university technical colleges and further education institutions; employers should do more to create apprenticeships.

None of these measures on their own will do enough to bring down costs and create domestic jobs, but unless Britain 'pumps up the volume' there is little prospect of either objective being achieved. Creating the clarity that industry needs, in tandem with the other ideas in this report, would give Britain's offshore wind sector the best possible chance of contributing to Britain's climate, jobs and economic rebalancing challenges.

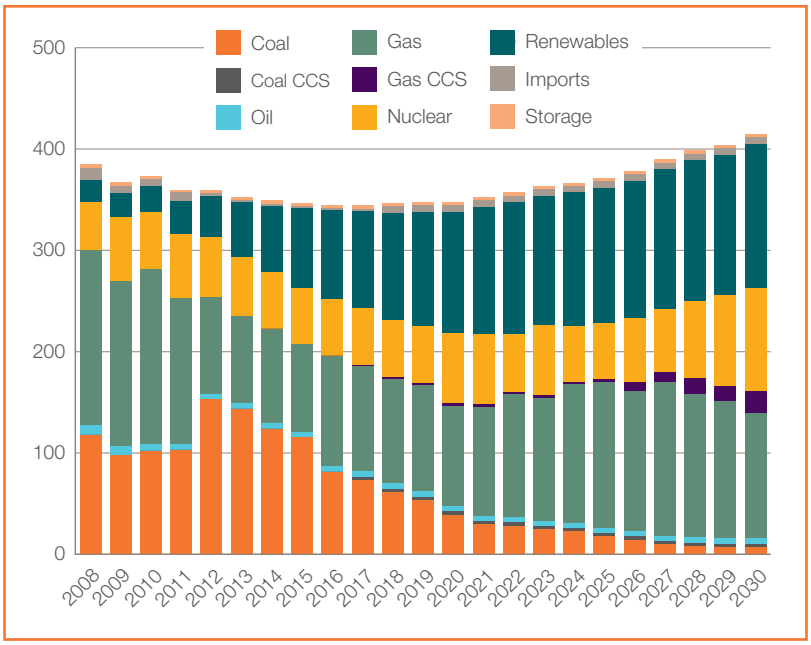
1. THE INEVITABILITY OF OFFSHORE WIND

The UK's existing sources of electricity are ageing and 80 per cent of current generation sources will need to be replaced by 2030 (OVG 2010). This includes most coal-fired power stations, some dirtier gas and oil power plants, and some ageing nuclear plants. Meanwhile, the electrification of heat and transport services and growth in the economy, if it returns robustly, will push up demand significantly. In order to facilitate this shift and keep the lights on, over 80GW of new capacity will need to be built by 2030[1] (DECC 2012a).

Furthermore, the Climate Change Act 2008 commits the UK to a legally binding target to reduce greenhouse gas emissions by 80 per cent by 2050 compared to 1990 levels. Alongside this, the UK is a signatory of the European Union's climate and energy package, which sets an ambition to reduce emissions and increase renewable deployment to 2020. This mandated a 34 per cent reduction in greenhouse gas emissions compared to 1990 levels and a target to increase the share of renewables to 15 per cent of the energy mix, by 2020.

Figure 1.1 shows DECC's 'central scenario' for how generation will change in the years ahead. It shows how coal generation will be replaced by an expansion in renewables, new nuclear and gas, with a small role for carbon capture and storage (both coal and gas). Renewables are expected to rise from 15 per cent of generation in 2013 to 35 per cent in 2020 and stay roughly at that share, even as total capacity rises to meet the increased demand.

Figure 1.1
Electricity generation by source, 2008–2030 (TWh)



Source: DECC 2012a

To meet this generation profile, the current and previous governments have been consistent in setting out a major role for offshore wind. Britain is already the world-leader in the exploitation of offshore wind. By June 2013, the UK had an installed offshore wind capacity of over 3.3GW and a further 1.3GW under construction.[2] During 2012, the UK installed 73 per cent of Europe's additional offshore capacity (EWEA 2013).

1 To put that number into context, the total installed capacity of the UK, from all sources of electricity generation, was 89GW in 2011 (DECC 2012b).

2 For up-to-date figures, see http://www.renewableuk.com/en/renewable-energy/wind-energy/uk-wind-energy-database/index.cfm

Opportunities and risks of developing an offshore wind industry in the UK

The development of an offshore wind industry in the UK presents three significant opportunities. First, as chapter 3 outlines in more detail, Britain is already a world-leader in many aspects of the supply chain for offshore wind. The UK has a significant skills base in large offshore energy projects built up over decades of North Sea oil and gas exploration. It has also started to develop a strong manufacturing base at many different stages of the offshore wind supply chain, including foundation manufacturing and electrical equipment supplies (EWEA 2011).

There are many elements to the business of offshore wind generation. Building offshore wind farms requires turbines, made up of blades, gearboxes, drive trains and castings to house components, and towers on which the turbines sit. Achieving growth in the market demands undersea cables and installation vessels, as well as upgrades to ports and the electricity network. Once the wind farms are in place, they need to be operated and maintained.

It is estimated that there are currently 3,200 full-time-equivalent (FTE) jobs in the UK wind industry (RUK 2011a). Most of these (41 per cent) are in construction and installation, while just 7 per cent are in design and manufacturing (RUK 2011b: 10). Despite the UK being the world's largest offshore wind farm market, none of the turbines installed in the UK to date were manufactured here (Climate Change Capital 2012). Interviewees have told IPPR that an important aspect of growing the domestic supply chain would be to manufacture offshore wind turbines in the UK as these components make up around 50 per cent of capital expenditure and 33 per cent of total expenditure (BVG 2013).

Second, the UK government has set out that it wants to rebalance the economy from south to north, from services to manufacturing, and from domestic consumption to net trade and investment (Cable 2011). The offshore wind industry helps with all three aims.

Creating additional jobs in the offshore wind industry will be an important step in rebalancing Britain's economy towards manufacturing. Since most offshore sites are situated in the North Sea and East Irish Sea, it will also help to rebalance the economy geographically away from London and the south east.

In terms of trade prospects, the UK is not alone in seeking to install offshore wind capacity, so there is an opportunity to develop exports in the sector, particularly of the skills, services and components required to build offshore wind farms and also in their operation and maintenance. Although still at the earliest stages of development, the annual rate of installation of new global offshore wind capacity is expected to surpass 5.6GW by 2016, reaching a total global installed capacity of 23.9GW by 2018. By 2021, the global installed offshore wind capacity is projected to pass 77.4GW (Navigant 2013).

It is estimated that exports to continental projects of nearly £25 billion are possible (BVG 2011). This would help to reduce Britain's current balance of payments deficit. Developing domestic sources of electricity through renewables would contribute to a reduction in imports of oil and gas, which tend to adversely affect Britain's balance of trade.

Third, Britain has a natural advantage in offshore wind. The UK has been referred to as the 'Saudi Arabia of offshore wind' because it possesses ideal building conditions within its territorial waters, with large swathes of seabed in shallow waters close to shore (Clark 2012, Wilson 2013, LCICG 2012).

There are, however, two significant challenges. First, offshore wind is currently more expensive than other technologies such as unabated gas, onshore wind or nuclear. By 2020, the cost is expected to have fallen rapidly but it will still be more expensive than those three technologies. Indeed, it is only expected to become cost-competitive with unabated gas by 2030 and, according to one source, will remain more expensive than onshore wind and nuclear (CCC 2013). As a result, the government has set the offshore wind industry an ambitious goal to bring down its cost of energy production to £100/MWh by 2020 in order to make it cost-competitive with other technologies (DECC 2011).

Second, British workers only produce a small proportion of the supply chain. Initial estimates of UK content for capital expenditure in recent wind farm developments have varied from 10 per cent for London Array Offshore wind farm, 20 per cent for Thanet Offshore wind farm, 48 per cent for E.ON's Scroby Sands development and 50 per cent for Vattenfall's Ormonde project. The most recent detailed analysis was for E.ON's Robin Rigg development, which estimated UK content at 32 per cent. The government is consulting on the feasibility of achieving the Offshore Wind Developers Forum's vision of 50 per cent local content (BIS 2013).

That said, analyses of UK content in capital expenditure do not include operational and maintenance costs, which are inherently local in nature and accumulate over the lifetime of a wind farm. They can also miss small components which may have been produced in the UK but then form part of larger components manufactured abroad. Nonetheless, levels of UK content will need to increase in order to realise the economic benefits of the sector in terms of jobs and growth and to maintain political commitment.

Report structure

The remainder of the report looks in further detail at the opportunities and risks of offshore wind.

Chapter 2 looks in more detail at current government policy and investigates some inherent contradictions which are destabilising the domestic industry.

Chapter 3 examines the potential for job creation in the offshore wind sector. It examines projections of potential new jobs in the UK and examines in which aspects of the supply chain these might occur.

Chapter 4 assesses three international case studies – Denmark, Germany and France – to see how different countries have approached offshore wind.

Chapter 5 sets out a series of policy recommendations for the UK government focused on a mixture of carrots, to provide policy certainty and support for innovation, and sticks, to bring down the price and guarantee a greater level of domestic content in the supply chain.

2. CONTRADICTIONS IN CURRENT GOVERNMENT POLICY

Offshore wind has an important role to play in decarbonising the power sector by 2030 and ensuring security of supply. Business and energy minister Michael Fallon (2013) has said: 'Britain has a real chance to lead the world in the offshore wind sector, not least because of our weather.' As the largest offshore wind market in the world, the UK has the potential to create thousands of domestic jobs and achieve some rebalancing in the economy.

The UK government stated in 2011 that 18GW of offshore wind could be deployed by 2020, with 'very high potential' for over 40GW by 2030 (DECC 2011). According to the Crown Estate (2012), the UK is capable of delivering 18GW by 2020. The updated project timelines published by RenewableUK (2013) demonstrate that the sector is on course and able to deliver this.

The government plans to support the development of offshore wind through measures set out in the draft Energy Bill, which is currently before parliament. The bill contains a package of policies to reform the electricity market and replace current support for renewables with new measures. As part of this, the government announced a support package for new renewable installation through an extension of the Levy Control Framework to £7.6 billion per year by 2020.[3]

There are, however, two inherent and confusing contradictions in the government's approach to renewable power, and offshore wind in particular.

The first lies in the stated ambition of government ministers. In interviews with industry, positive government rhetoric on offshore wind from the prime minister David Cameron (see Cameron 2012) and energy secretary Ed Davey has contrasted with the chancellor George Osborne's ambition for the UK to become a 'gas hub', his aversion to new technology-specific targets, and scenarios in DECC's gas generation strategy, which includes a pathway to a carbon intensity of 200gCO_2/KWh by 2030 (see Guardian 2013). The Committee on Climate Change (CCC) has said that this carbon pathway would 'store up costs and risks for the future' (CCC 2013).

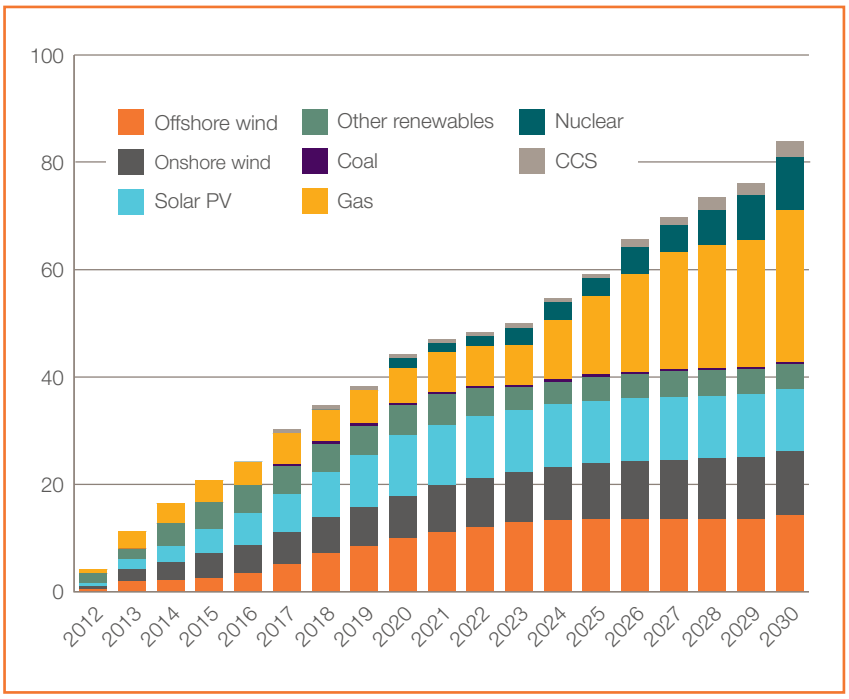
Although these differences might be understood by UK observers as the playing-out of Coalition negotiations, government projections of the sources of new generation to 2030 put this lack of clarity into context (see figure 2.1). Between 2012 and 2020 there will be 34.7GW of new renewable capacity added to the grid, making up around 80 per cent of a total of 44.1GW of new capacity. Offshore wind is the second biggest component of this new capacity,[4] and is projected to provide a total of 11.5GW by 2020 – crucially, this is much less than the ambition of 18GW outlined by DECC (as noted above). Indeed, DECC recently announced that the subsidy regime would lead to deployment of just 8–16 GW by 2020.[5]

3 The Levy Control Framework is effectively a cap on how much money energy companies can charge consumers to pay for certain government policies. Currently it covers the Renewables Obligation and had been set to expire in 2014/15 but government has now confirmed it will continue to 2020 and will cover feed-in tariffs for contracts for difference proposed to be introduced by the Energy Bill to replace the Renewables Obligation.

4 After solar photovoltaic, or 'solar PV'.

5 See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209360/Strike_prices_with_Over_1_Gigawatt_of_Potential_Deployment.pdf

Figure 2.1
Cumulative new-build generation capacity, 2012–2030 (GW)



Source: DECC 2012a

The second contradiction is that the government has been unwilling to provide any certainty beyond 2020 for its offshore wind ambition despite this being the policy that would most effectively guarantee cost reduction (to a level below £100/MWh) and growth in the domestic supply chain.

There are currently no details about the size of the Levy Control Framework after 2020. The government has refused to adopt a target to decarbonise the power sector by 2030 despite the advice of the CCC (2013). It also opposes a renewable target at the EU level as 'inflexible and unnecessary' (DECC 2013a).

There are long lead times of up to seven years involved in planning and developing offshore wind farms, and high capital costs running into the tens of millions of pounds incurred by both developers themselves and by the supply chain in investing in the facilities needed to make the parts for offshore wind farms. Developers and suppliers alike need to know what the demand will be for their product beyond 2020.

After that point, however, new capacity is projected by government to come primarily from nuclear, carbon capture and storage (CCS) and new gas. Out of a total of 39.9GW of new capacity in the 2020s, just 7.6GW (19 per cent) is expected to come from new renewables, including just 4.4GW from offshore wind (5 per cent). At the same time, by contrast, gas (54 per cent) and nuclear (21 per cent) are expected to make up the bulk of that new capacity. In effect, this policy means that the government is undertaking a 'dash for renewables' in the current decade followed by a 'dash for gas' in the 2020s. Given the long lead times, the lack of certainty beyond 2020 is destabilising the offshore wind industry.

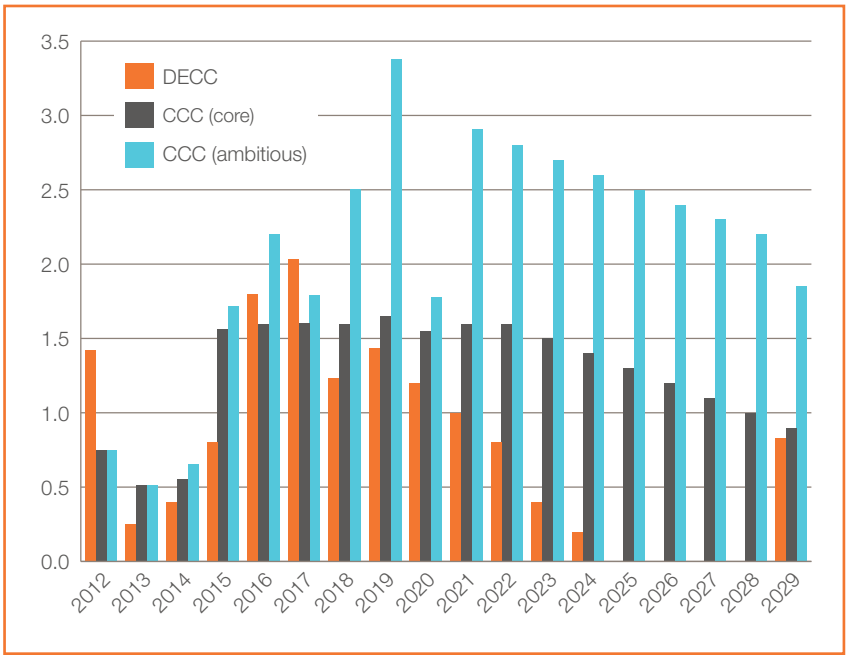
DECC's central scenario, which is consistent with a carbon intensity of 100gCO_2/KWh by 2030, anticipates just 16GW of offshore wind capacity by 2030. The CCC has concluded:

> **'[DECC's central] scenario with high nuclear deployment, but low investment in CCS and offshore wind during the 2020s … would leave the UK overly reliant on a single low-carbon technology … This would imply unacceptable costs and risks of achieving the 2050 target and/or of very high electricity prices required to deploy uncommercialised low-carbon options at scale after 2030.'**
> CCC 2013

Instead, the CCC has set out several scenarios showing how a carbon intensity of 50gCO_2/KWh by 2030 could be achieved, thereby keeping Britain on course to cut 80 per cent of carbon emissions by 2050 (CCC 2013). Three of their four scenarios estimate 26GW of offshore wind by 2030; the fourth scenario anticipates 40GW. Even the CCC's fifth scenario under 'less favourable conditions', which assumes that the cost of offshore wind does not fall, would still deliver 20GW of offshore wind by 2030.

Figure 2.2 compares DECC's central scenario to 2030 with the CCC's core scenario and their 'ambitious renewable' scenario. This lower ambition is likely to result in lower levels of domestic content and therefore fewer jobs, as chapter 4 explains in more detail. This in turn will reduce the benefits to GDP of offshore wind. Sensitivity analysis in a recent report, which concluded that wind provided greater economic benefits than gas, found that 'securing the supply chain in the UK is key to the overall magnitude of the economic results'. Indeed, if imported content remained at 67 per cent in 2030 then the positive impact on GDP of wind compared to gas would fall from 0.8 per cent to just 0.2 per cent (Crown Estate 2012a).

Figure 2.2
Annual new build of offshore wind per annum, three scenarios, 2012–2029 (GW)



Source: DECC 2012a, CCC 2013

3. MAXIMISING DOMESTIC JOBS FROM OFFSHORE WIND

Major infrastructure projects, by their nature, create new jobs. Projects need to be planned and developed, designed and manufactured, and constructed and installed. This process involves numerous companies in the supply chain providing individual components or logistical support. Then, once the wind farm has been delivered, they need to be operated and maintained. Jobs from support services are provided throughout the process.

Jobs in offshore wind

In recent years there have been a number of studies attempting to estimate how many jobs would be created by an increase in offshore wind by the end of 2020 (Carbon Trust 2008, Boettcher et al 2008, RUK 2011a, CEBR 2012). Table 3.1 summarises the main findings of each study.

Table 3.1
Jobs, domestic content and exports in a range of offshore wind scenarios

Study (scenario)	Capacity (MW)	Jobs	Implied jobs created per MW	Domestic content	Exports
Carbon Trust 2008	29,000	40,000 base case + 30,000 additional jobs with proactive manufacturing strategy = up to 70,000 jobs	2.41	NA	£8bn in annual revenues
BNP 2008 (static)	11,575	14,711	1.27	70–100%*	5–60%**
BNP 2008 (base)	14,766	25,462	1.72	70–100%	5–60%
BNP 2008 (dynamic)	19,564	42,745	2.18	70–100%	5–60%
RUK 2011a (low)	13,000	11,800 direct FTEs 6,400 indirect FTEs = 18,200	1.40	6%	4% of EU
RUK 2011a (medium)	23,000	29,700 direct FTEs 17,500 indirect FTEs = 47,200	2.05	40%	25% of EU
RUK 2011a (high)	31,000	42,400 direct FTEs 25,300 indirect FTEs = 67,700	2.18	55%	30% of EU
CEBR 2012 (slow)	11,000	22,863 direct jobs	2.08	45%	4%
CEBR 2012 (central)	17,000	40,530 direct jobs	2.38	53%	9%
CEBR 2012 (aggressive)	33,000	77,977 direct jobs	2.36	64%	16%

* 100% of planning and development; 70% of design and manufacturing; 95% of construction and installation; 95% of operations and maintenance; and 95% of technical, financial and legal services.
** 10% of planning and development; 35% of design and manufacturing; 35% of construction and installation; 5% of operations and maintenance; and 60% of technical, financial and legal services.

The methodology used for each study is different and there are markedly different estimates of the share of domestic content and the export potential. Job estimates refer to both the development and construction and operation and maintenance phases and are therefore indicative. Notwithstanding these differences, two characteristics stand out.

First, estimates of the number of jobs per MW of new installed capacity fall within a fairly narrow range of 1.27 to 2.41, with a median average of 2.13.

Second, the number of jobs per MW tends to increase as the installed capacity goes up. This is because every study assumes that benefits within the supply chain and export potential increase with scale. Given the cost of transporting components for offshore wind, this seems like a plausible assumption and was corroborated by IPPR's interviews with key industry stakeholders throughout the course of this project.

If these figures were accurate, it would imply that the UK could expect the following number of jobs by 2020:

- Capacity of 11.5GW, as implied by DECC's central scenario, would deliver 14,600 to 27,700 jobs
- 18GW as implied by the Crown Estate would deliver 22,900 to 43,400 jobs.

By 2030:

- 16GW as implied in DECC's central scenario would deliver 20,300 to 38,600 jobs
- 26GW as implied by the CCC's core scenario would deliver 33,000 to 62,700 jobs
- 40GW as implied by CCC's high scenario would deliver 50,800 to 96,400 jobs.

Comparisons with other forms of generation

Offshore wind is not, of course, the only form of generation which generates jobs. As well as assessing the likely impact on jobs of developing new offshore wind capacity, it is worth considering how many jobs would be created if alternative forms of generation were built.

Table 3.2 provides a comparison of average job-years for various technologies in the United States. As a result, it is not directly comparable to the UK. With that caveat, however, it shows that offshore wind provides more job-years per GWh than coal, gas or nuclear power. Although this study does not differentiate onshore from offshore wind, nonetheless offshore wind has been shown to be more labour-intensive than onshore wind (DTI 2004).

Table 3.2
Average job-years per GWh, by technology

Energy technology	Capacity factor*	Lifetime (years)	Average job-years / GWh
Solar PV	20%	25	0.87
Landfill gas	85%	40	0.72
Small hydro	55%	40	0.27
Geothermal	90%	40	0.25
Biomass	85%	40	0.24
Solar thermal	40%	25	0.23
Carbon capture and storage	80%	40	0.18
Wind	**35%**	**25**	**0.17**
Nuclear	90%	40	0.14
Coal	80%	40	0.11
Natural gas	85%	40	0.11

Source: Wei et al 2010
* Capacity factor denotes the fraction of a year that the facility is in operation.

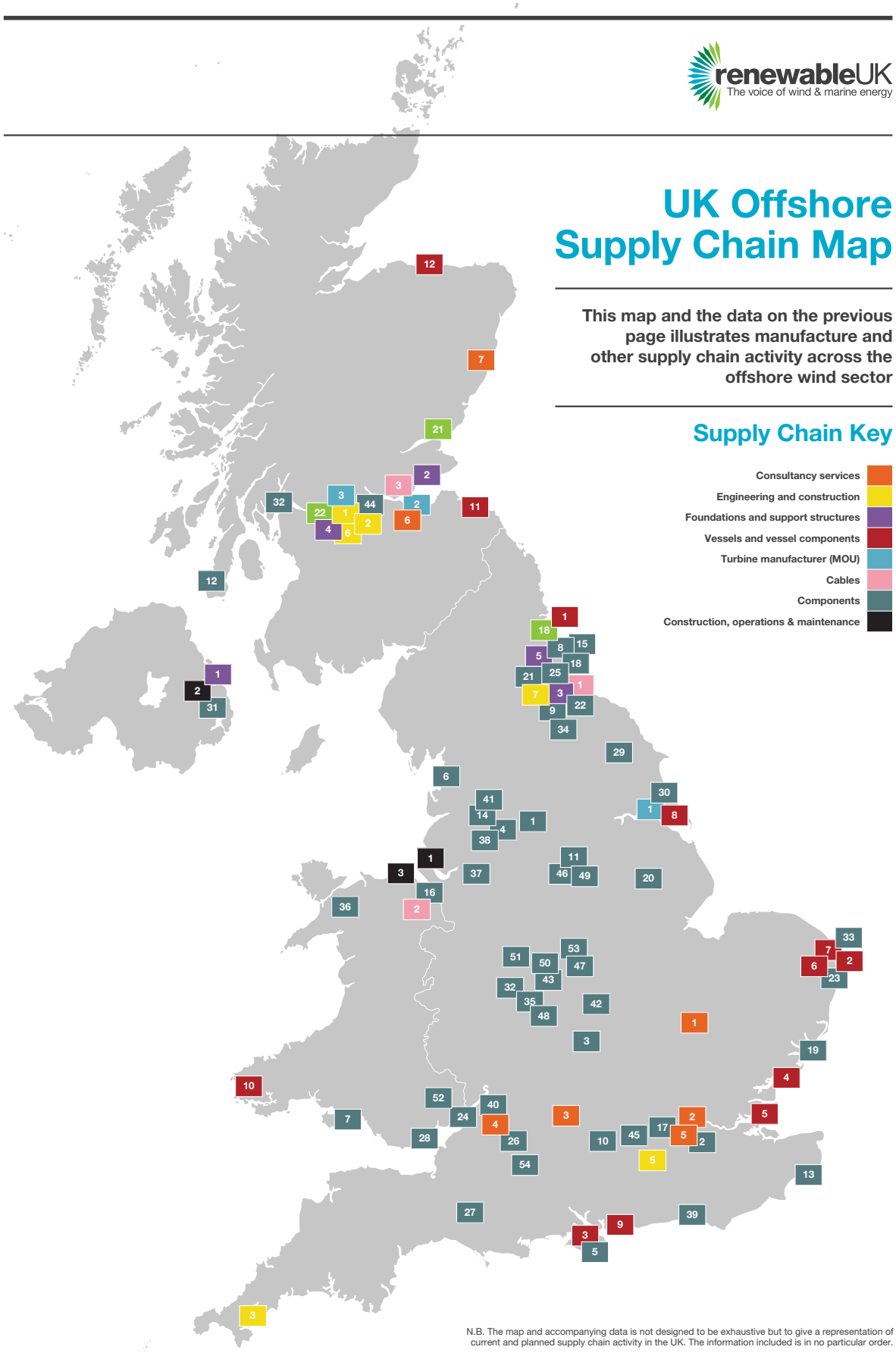
The domestic supply chain

Given how critical the offshore wind supply chain is in capturing the economic benefits of industry expansion, it is important to know where the UK's current strengths and weaknesses lie. There are seven key types of company that form the supply chain, as set out in table 3.3.

Table 3.3 Offshore wind supply chain, companies (see figure 3.1 for locations)

Consultancy services	Engineering and construction	Foundations and support structures	Vessels & vessel components	Turbines (MOUs)	Cables	Components	Construction, Operations and Maintenance
1 Niras	1 Balfour Beatty	1 Harland & Wolff	1 Alnmaritec	1 Siemens	1 JDR Cables	1 David Brown Gears	1 Cammell Laird
2 ABS Consulting	2 Sgurr	2 BiFab	2 Gardline Alicat	2 Gamesa	2 Prysmian	2 SEM Motors	2 Belfast Harbour
3 BVG Associates	3 Fugro	3 TAG Energy	3 South Boats	3 AREVA	3 Oceaneering	3 Mettex	3 Port of Mostyn
4 GL Garrad Hassan	4 Fluor	4 Steel Engineering	4 Blyth Work Cats	Alstom		4 SlingCo	
5 DNV Kema	5 KBR	5 Aquind (OGN group)	5 Ctruk	Vestas		5 Gurit	
6 ESS Ecology	6 Atkins		6 Goodchild Marine	RePower		6 Optech Fibres	
7 Xodus	7 SKM		7 E-Tech	Mitsubishi		7 Morgan AM&T	
			8 Dunston Ship Builders	Samsung		8 MCPS	
			9 Aluminium Boatbuilding Co			9 Tekmar	
			10 Mustang Marine			10 MOOG	
			11 Coastal Marine Boatbuilders			11 MTL Group	
			12 Buckie Shipyard			12 Wind Towers Ltd	
						13 H V Wooding	
						14 Granada Material Handling	
						15 Tata Steel	Components continued
						16 DRB Group	
						17 Houlder	36 DMM Professional
						18 Roballo	37 Lofrix
						19 AJ Woods	38 Roxtec
						20 Fenner Precision	39 Tideland Signal
						21 International Paints	40 Renishaw
						22 Heerema	41 Tensar
						23 SLP Engineering	42 Hi-Force
						24 Mabey Bridge	43 Pammenter & Petrie
						25 SMD	44 Highland Galvanisers
						26 IXYS UK Westcode	45 Morgan Crucible
						27 Cerdic Foundries	46 Cooper and Turner
						28 Celsa Steel	47 Formax
						29 Ellis	48 Hydratight
						30 Spencer Group	49 Macalloy
						31 Spanwall	50 Revolvo
						32 James Walker Group	51 Parkburn Precision Handling Systems
						33 Subsea Protection Systems (SPS)	52 Safety Technology
						34 Pipeline Engineering	53 PPG
						35 Lynx Metmasts	54 Latchways

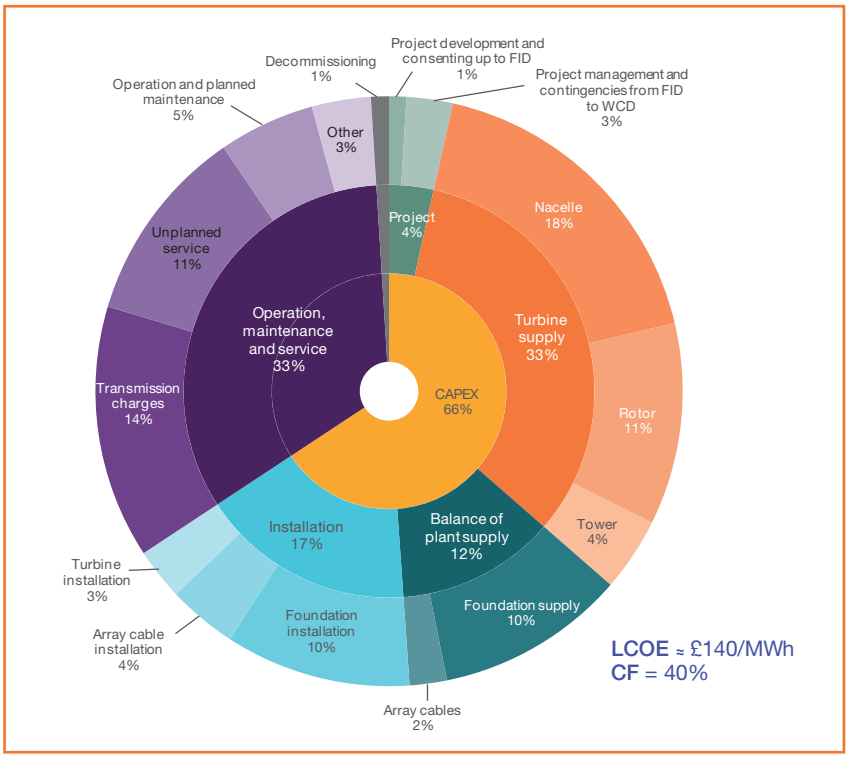
Figure 3.1 Offshore wind supply chain, UK locations (see table 3.3 for companies)



The UK has strengths in a number of sectors within the offshore wind supply chain which have developed as a result of the recent expansion in new renewable capacity. Foundation manufacturing and electrical equipment supplies are two major assets.

Foundation manufacturing typically represents over 20 per cent of the content value in an offshore wind farm so this is a significant strength for the UK. Companies include manufacturers with a focus on different forms of turbine support structure, including monopiles (such as Tag Energy) and jacket foundations (BiFAB, Harland and Wolf and Smulders).

Figure 3.2
Proportion of levelised cost of energy for a typical wind farm constructed in 2013



Source: Reproduced from BVG 2013

Other strengths that have been identified for the UK supply chain are grid connection – including subsea cables, gearboxes, generators and transformers (Crown Estate 2010) – and professional services, such as consultancy and engineering services. There is also potential for the oil and gas workforce to transfer their skills to meet demand in the operation and maintenance of wind farms.

Despite these successes, the rest of the UK supply chain remains underdeveloped. Compared with European countries such as Denmark, Germany, the Netherlands and Belgium, it has been slow to mature (EWEA 2011).

Many areas of the supply chain suffer from low levels of competition, with relatively few new entrants. The resulting low levels of competitive pressure mean that prices for capital and operations and maintenance contracts are high (Crown Estate 2012). This weakens the short-term economic viability of individual projects and reduces investor appetite and deployment rates in the longer term.

Supply chain areas that have been identified as potentially inadequate to meet demand include the manufacturing of turbine blades, large component castings and forgings, and high-voltage direct current (HVDC) cabling and equipment (OWCRT 2012, Crown Estate 2010). These are all areas that either are or could become a limitation on the growth of the sector and create or expand the need to import from overseas manufacturers.

Perhaps most significant concern is the fact that the UK has not yet attracted a wind turbine manufacturer. Turbine supply makes up around one-third of the levelised costs of a typical wind farm (as in figure 3.2). By contrast, Germany and Denmark have three major turbine manufacturing companies each.

Siemens is the dominant player in the supply of offshore wind turbines and provides nearly two-thirds of all turbines installed in UK waters. Vestas and REPower also supply the UK market, while Areva supplies offshore wind turbines to the rest of the EU but is yet to be active in the UK market (Crown Estate 2012a).

Siemens is planning a new UK assembly facility on the north east coast, in Hull, for its forthcoming 6.0 direct drive model, a 'new generation' wind turbine (see Young 2013). However, this is pending a final investment decision, and the company has been urging a guarantee of ambition for the UK offshore wind sector after 2020.[6] Altogether, 10 companies have made announcements that they plan to invest in manufacturing facilities in the UK, including some based in low-cost countries such as China, India and Korea (ibid). None has made a final investment decision, however, and currently it seems unlikely that all of these will result in positive decisions being made.

The lack of a major turbine manufacturer in the UK is a key factor in the low level of domestic content in UK wind farm developments. According to one study, 3GW of new capacity per year is needed to create sufficient turbine demand to convince manufactures to locate here (RUK 2011a). However, interviewees told us that one turbine manufacturer could be attracted if there was at least 1.5 to 2GW per year.

Failure to attract any turbine manufacturers would have a significant impact on jobs. The Carbon Trust estimates that the number of domestic jobs created for 29GW of capacity would be 40,000 without original equipment manufacturer increasing to 70,000 if two or three such manufacturers moved here by 2020 (Carbon Trust 2008). This suggests that serious efforts are needed to encourage a turbine manufacturer to locate to the UK.

6 See http://www.foe.co.uk/resource/briefing_notes/2030_decarb_for_against.pdf

4. LESSONS FROM EUROPE

This chapter looks at three international examples – France, Germany and Denmark – and the approaches that these countries have taken to the development of their offshore wind supply chain.

Denmark – 'early adopter'

While the UK has the largest share of installed and planned offshore wind in the world, Denmark leads in offshore wind manufacturing. Despite the fact that Denmark has only 0.921GW of installed offshore wind capacity[7] and plans to tender for only 0.45GW next year, it provides an example for what a strong UK supply chain could look like (EWEA 2013).

The secret to Denmark's success lies in the foresight that government and industry showed in recognising the potential of wind power decades ago. Since the late 1970s, successive governments have given strong financial support to the fledgling market, provided policy certainty, and ensured a stable regulatory environment. As a result, the wind power supply chain in Denmark now requires little direct support from government.

A history of clarity and certainty

In the late 1970s and early '80s, amid concerns over the carbon content of Denmark's largely coal-fired electricity generation and scepticism about nuclear power,[8] the Danish government decided to boost support for wind generation. The government provided wind power developers with 30 per cent of capital costs; turbines installed by cooperatives were awarded tax breaks on investments; utilities were required to purchase a consistent amount of wind-generated power at an above-market price. The government-funded Risø research centre at the Technical University of Denmark provided innovation support to pioneer a variety of technologies relating to the exploration and exploitation of wind resources (Arnold et al 2009). The industry response included the decision of Vestas, a Danish manufacturing company founded in the late 19th century, to begin manufacturing wind turbines in 1979 – by the late 1980s, Vestas had become exclusively a manufacturer of wind turbines.[9]

During the 1990s, capital support was phased out and replaced by feed-in tariffs. Export credit guarantees were introduced for the supply chain, reducing its financing costs and providing security to its investors. From 1987 onwards, different coalition governments first introduced and maintained a target of 10 per cent renewable production by 2005 and then increased it to 16 per cent by 2003. Two experimental offshore wind farms were built in Denmark in the 1990s; in the early 2000s, two larger offshore wind farms of 0.16GW each were built at Horns Rev and Rødsand. By 2002, Denmark had exceeded its target with wind accounting for 18 per cent of energy production (Krohn 2002).

This support for developers created the demand for a supply chain capable of providing the parts needed to build both onshore and offshore wind turbines. In 2004, Siemens, a German company, took over Bonus Energy,[10] a Danish wind turbine manufacturer (previously, of irrigation systems), which has resulted in the strong Danish base for production of wind power turbines that Siemens has today.

7 This makes Denmark the second-biggest European market today, after the UK.

8 The Danes banned nuclear power in 1985 leaving only renewables and CCS as the only means of decarbonising its electricity production.

9 See http://www.vestas.com/en/about-vestas/profile/vestas-brief-history.aspx

10 See http://www.powerengineeringint.com/articles/print/volume-12/issue-11/regulars/news-analysis/a-wind-bonus-for-siemens.html

As the international market in offshore wind began to take off, Siemens and Vestas diversified their activities to include the assembly of offshore turbines. The limited size of the domestic market means that the Danish supply chain has to look to foreign exports, including to the UK, to thrive (EWEA 2013). So far, this has been successful: by the end of 2012, Siemens and Vestas had together manufactured 86 per cent of all offshore turbines in Europe (ibid). In all, wind power employs 25,000 Danish people and accounts for 8.5 per cent of Danish exports (DWIA, no date).

The Danish wind industry, including the offshore wind industry, now enjoys high levels of public support. The tax breaks for cooperatives meant that, by 2001, 100,000 Danish families owned 86 per cent of Danish wind turbines; half of the turbines in Middelgrunden, an offshore wind farm built in 2000 – the biggest in the world at that time – were owned by 10,000 Danish families (Larsen 2001). That being said, as wind farms have expanded a greater share of financing has had to come from the private sector.

Industrial alliances

The industry is geographically clustered, with around 80 companies in close proximity in central Denmark making up the entire supply chain. As developers have increasingly demanded an integrated approach from their supply chain in order to address both the technological difficulties involved in building an offshore wind farm and the inherent logistical challenges of large developments involving multiple parties, the Danish supply chain has organised itself into a variety of collaborative networks. Two of the biggest are Megavind and Midtvind. The former is supported by a government-funded secretariat; the latter initially received 50 per cent government funding but is now industry-funded.[11]

Skills

Denmark boasts a globally renowned offshore wind skills-base, cultivated since the earliest beginnings of the industry and including many engineers 'born and raised' in wind power (Aarhus, no date). The Danish Wind Industry Association works with Danish universities on the content and delivery of education, including a masters degree in wind energy, and training for PhD students. It has also established an online 'Talent Factory'[12] through which companies educate and engage trainee engineers, through online lectures for example (DWIA, no date).

Innovation

Universities and industry also collaborate on innovation for offshore wind. Test sites for turbines are located at Høvsøre and Østerild, owned by the Technical University of Denmark and operated on commercial terms. A blade-testing centre is also operated by the Technical University and a lighting test centre is privately owned and operated in Jutland. In 2009, industry collaborated to open the Lindoe Offshore Renewable Center, with EU funding, to carry out further research, including into fibre laser welding for manufacturing towers and foundations. All of this is necessary to achieve the industry's stated aim of reducing the cost of offshore wind energy by 50 per cent between 2010 and 2020 to somewhere in the €67–€90/MWh range[13] (DWIA, no date; Megavind 2013).

11 Email communication with the Danish Wind Industry Association

12 www.talentfactory.dk

13 The difference results from disagreement within Megavind on the methodology and site comparison parameters necessary to establish the 2010 baseline of the levelised cost of energy.

Current government policy

Government support currently comes from two main sources. First, stable cross-party support for the direction of policy continues, with a legislative target of 50 per cent renewable generation by 2020. Debate over the years has focused on the quantum of support, not the principle (Christianson, no date). Second, in 2009, the government introduced negative pricing into the market. When there is a surplus of supply, prices can go negative and generators must pay to dispose of their electricity. This hits large generators with fuel costs hardest and is specifically designed to promote renewable energy (ICIS 2009).

Denmark has never had a domestic content requirement for its offshore wind farms. Instead, industry and government have explicitly focused on building on the existing onshore wind supply chain and driving down the cost of energy. As a result, no overseas-built wind turbine has ever been installed in Denmark. The strong supply chain, which has resulted from getting ahead of the curve and years of policy continuity, has naturally resulted in these high levels of domestic content.[14]

Germany – 'rapid expansion'

Germany is Europe's largest market for wind power (EWEA 2012). By the end of 2012, it had over 31GW of installed capacity of onshore wind power, accounting for 30 per cent of Europe's installed wind power generation and 12 per cent of the world's. It is, however, a relatively new entrant to the offshore market: by 2012, it only had 0.28GW of installed offshore wind capacity (EWEA 2013).

Germany's ambitions for offshore wind were, until recently, fairly limited. The disaster at the Fukushima nuclear power plant in Japan changed this. Political pressure within Germany to abandon nuclear power escalated and, in May 2011, the government suddenly reversed its position on nuclear, announcing that all German nuclear reactors would be closed by 2022. Germany already had in place an ambitious decarbonisation agenda – the *Energiewende* or 'energy transition'. However, the decision on nuclear power means that Germany has to replace 20 per cent of its energy mix over 11 years – unsurprisingly, this has led to a renewed focus on renewable energy, including offshore wind.

Although Germany already had strong ambition for renewables, the need to bring about a rapid expansion of its capacity led to the German government passing legislation in 2011 to begin preparations for ramping up renewables (FMET 2012). By June 2011, Germany had 31GW of offshore wind capacity in the pipeline, with estimates of 6–7GW of capacity being installed by the end of the decade (EWEA 2011, GTIA 2013).

Germany's dominance in the onshore wind market meant that it was well-placed to increase offshore wind capacity. However, achieving the transition from a standing start through to mass planned deployment of offshore wind has only been made possible by a strong policy framework, financial support for supply chain development, and the upgrading of key infrastructure.

Policy certainty

The German government has provided policy certainty for renewable energy with a guaranteed feed-in tariff or, at the developer's choice, a market premium, as is outlined in the box below. The rules of the feed-in tariff are described in the Renewable Energy Sources Act, which is regularly revised by government to reflect changing costs of

14 Email communication with the Danish Wind Industry Association

electricity from renewable technologies.[15] The policy has provided stability for, and facilitated the expansion of, the solar PV and onshore wind sectors – more recently, it has done the same for offshore wind.

More recently, however, this policy certainty has been shaken by growing public and media concern about the costs of the resulting levy on consumer bills. Chancellor Merkel has assured industry that the government will not impose retrospective cuts (E&Y 2013). Nonetheless, it seems likely that the feed-in tariff scheme will be revised by any incoming government after the Germany federal election in September 2013.

Government financial support for offshore wind farm developers

The German government offers a choice of financial support to offshore wind farm developers. The first option is a guaranteed feed-in tariff lasting 20 years plus the year of commissioning. For offshore wind, this is equivalent to either €0.15 per kWh for the first 12 years or €0.19 per kWh for the first eight years (depending on depth of water and distance to shore). Thereafter the tariff drops to €0.035 per kWh.

Alternatively, in order to encourage developers to sell their power directly to the energy exchange, they can forgo the feed-in tariff and instead receive a reference price[16] plus a market premium and a management premium. The management premium covers costs of participating in the market, whereas the market premium is calculated as the difference between the reference price and the feed-in tariff that would have been received had the developer chosen that option. So, if the developer sells electricity on the market for a price higher than the reference price then they can receive a higher income than if they had opted for the feed-in tariff (GTIA 2013).

Support for critical infrastructure

Germany has already begun to upgrade its ports and grid infrastructure to support the offshore wind market. German ports are being adapted not only to meet the demands of the domestic offshore wind industry but also to facilitate exports to foreign markets. This has been a key aspect of Germany's success in the sector: because ports are owned and administered by local municipalities, long-term investment decisions can be made which take into account local economic benefits, including jobs. Private investors have been able to secure favourable interest rates and short-term leases from these ports, which has allowed developments to proceed at a steady pace.

The development of the offshore wind sector has been motivated by its economic potential, as well as its importance in the *Energiewende*. Bremerhaven was the first region in Germany to actively develop an offshore wind industry. In the 1990s, it was in the grip of a deep economic recession, with declining fishing and shipping sectors. High levels of unemployment were spurring young people to leave the region. After identifying the economic potential of offshore wind, the municipal government identified several key areas for installations and began to promote the industry. Around €200 million was invested by the state government in building an offshore terminal for both cargo handling and assembly of turbines on the banks of the Weser.

15 The feed-in tariff rate for a particular technology changes according to progress against targets for volume of installed capacity. When the total additional capacity installed exceeds or falls below a certain amount, the degression percentage increases or decreases by a statutorily fixed number of percentage points ('flexible cap').

16 This is based on an average of reference market prices.

As a result of this activity, Bremerhaven saw its unemployment rate decline even as it continued to rise in other cities. By 2012 Bremerhaven had 5,000 people employed in offshore wind power, or approximately one-third of all employees in the offshore wind sector nationwide (Azau 2012).

In light of the strong, positive economic impact of the industry's development in the region, particularly on its employment rate, Bremerhaven has become a model for other regions interested in replicating its success (Rostock Business 2013). In Cuxhaven, Lower Saxony, the state government has invested in the first base harbour for offshore wind. Adaptations include providing large storage areas and space to preassemble foundations and turbines, as well as reinforcements to cope with heavy loads.

E.ON is the first offshore operator to use the facilities at Cuxport as an installation port, reinforcing Cuxhaven's role as a leading base port for offshore wind power development on the North Sea. Again, the ownership of port infrastructure by local municipalities has made the development of these facilities relatively straightforward, due to lower investment rates and the availability of short-term leases (EWEA 2011, GTIA 2013).

In terms of grid infrastructure, the German government has taken steps to resolve Germany's significant connection problems, in response to industry concerns. It legislated in December 2012 to mandate new liability rules and to require the transmission grid operators to prepare, during the first quarter of 2013, a comprehensive offshore grid development plan and a variety of damage mitigation strategies (EWEA 2013).

As a result, a network development plan has been put in place to authorise the new power lines that need to be built to link offshore wind generation from northern Germany with towns and cities in the middle and south of the country. This is accompanied by Germany's first draft offshore network development plan, which sets out a general obligation on the offshore grid operator to connect offshore wind farms to the grid. These plans have improved investment conditions for offshore wind power and given industry the certainty it needs to grow. Recently, however, industry has warned of the potential impact of delays in the implementation of the grid plans (Backwell 2012).[17]

Access to finance

Germany's national and regional investment banks have played a significant role in the development of the supply chain. For offshore wind developers, the KfW – government-owned development bank – provides credits for an offshore wind loan programme to develop capacity at rates lower than standard commercial rates. For the supply chain, the support of Germany's regional investment banks has enabled their expansion and increased their coverage across the country.

As a consequence of policy certainty and access to cheap finance, the supply chain in Germany is strong. REPower, Areva and Bard all operate turbine manufacturing facilities in Germany. The country also has two manufacturers of subsea cables (NKT and General Cable) as well as shipyards where Van Oord is building wind farm installation vessels (EWEA 2011).

17 See http://www.rechargenews.com/wind/article1295110.ece

France – 'pro-growth, pro-jobs, high cost'

France is the nuclear giant of Europe, with that technology generating over 79 per cent of its electricity in 2011. Following the Fukushima tragedy in Japan, however, President Hollande made it an election campaign pledge to reduce this to 50 per cent by 2025, and France is required under the EU Renewables Directive to generate 23 per cent of its energy from renewable sources by 2020. Currently, its renewable energy is derived primarily from hydropower, with 25GW of installed capacity (NR 2013).

Compared with the UK, France's market and ambition for offshore wind pales into insignificance. It has no installed offshore wind capacity at present and aims to have only 6GW of installed capacity by 2020, with 2GW of that capacity having been successfully bid for to date.

Despite this, manufacturer Alstom announced in January 2013 that it was going to build two factories at Saint-Nazaire in 2014 to produce nacelles and generators and a further two factories at Cherbourg in 2015 to build blades and towers. The company believes that these factories will lead to an industrial cluster providing 7,000 jobs (Alstom 2013).

The secret to French success in attracting offshore wind manufacturers lies in government strategy and ministerial activism, particularly through its approach to procurement and by providing state finance to firms in the private sector. However, the subsidy levels for the wind industry, including offshore wind, is higher than in Germany, Denmark and the UK. Indeed, the cost of offshore wind has been in the range of €175–€200/MWh (3E 2013).

Ministerial activism and procurement policy

The French government has been under sustained pressure to create jobs. In the course of our research, interviewees mentioned the political fall-out from French solar power policy, which resulted in solar PV panels being produced in China. Interviewees with expertise on France told IPPR that French ministers were highly active in the award to Alstom described above, and that the French civil service reduced the required level of background research into and analysis of the potential benefits and risks that offshore wind would pose to France than would have been done in the UK.

This ministerial activism was a key driver in three out of the four wind farms that were awarded to a consortium made up by EDF EN, Dong Energy, Nass&Wind, WPD Offshore and Poweo.[18] Alstom was made an exclusive supplier to this consortium and therefore most of the ensuing jobs will be located in France.

For each of these concessions, the invitation to tender[19] did not include any explicit local content criteria. Instead, the French government opted to assess bids on the basis of which would be the 'most economically advantageous', creating a lot of flexibility. The government stated that bids for their offshore wind farms would be evaluated against three criteria with different weightings: price (40 per cent), industrial organisation (40 per cent) and respect for the environment/existing activities (20 per cent).

The industrial organisation assessment included a requirement for bidders to include copies of their supply chain contracts, to demonstrate their 'robustness'. This was worth 14 per cent of the bid.

18 The fourth concession was awarded to a consortium made up by Iberdrola, Eole Res, Technip and Neoen Marine.

19 Available, in French, at http://www.cre.fr/documents/appels-d-offres/appel-d-offres-portant-sur-des-installations-eoliennes-de-production-d-electricite-en-mer-en-france-metropolitaine

IPPR's research has not revealed how this 'robustness' test was assessed by the French government, but interviewees did state that, as a consequence of this criterion, bidders put considerable effort into demonstrating their supply chain links with local firms.

As chapter 5 sets out, at certain points in the supply chain transport logistics become complicated. In the context of offshore wind, then, geographical proximity to a port would certainly aid in demonstrating the 'robustness' of the supply chain. One of the awarded wind farms is at Saint-Nazaire, which is also the site of two of Alstom's future factories. Cherbourg, the site of the other two Alstom factories, is strategically placed close to the other awarded wind farms at Fécamp, Courseulles-sur-Mer and Saint-Brieuc. Other, smaller components of the industrial organisation assessment which would have lent themselves to this assessment included 'strategies for mitigating logistical risks and nuisances' (avoiding disturbances to the local area), such as shortening the distance that equipment would have to travel, and investment in research into and development of offshore wind potential along French coastlines.

Interviewees were, however, keen to stress that it was the ministerial activism that was key to the success of the French government in convincing Alstom to build four factories. They noted that the reduced level of risk assessment meant that awards made were conditional upon environmental assessments being carried out. Although this does create some uncertainty for the winning bidders and their financiers, it did not give rise to a commercially unmanageable level of risk.

Financial support

Three of the factories to be built by Alstom are 50 per cent financed directly by the French government through a state investment scheme known as *investissements d'avenir* (investments for the future), which was enacted in March 2010.[20] Interviewees have told IPPR that the investment was made on a 50:50 basis by industry and government, and the French government's contribution amounted to €100 million. This direct funding to the supply chain is separate from funding that the French government offers to developers themselves through the French feed-in tariff.

Under EU state aid rules, direct financial contributions to the private sector of this kind is prohibited unless it is covered by specific exemptions or is approved by the European Commission.[21] Failure to comply with these rules would mean that, if they were successfully enforced, Alstom would be required to repay the financing to the French government with interest. This could put the feasibility of the whole project at risk. It is not possible to independently verify if any application for approval by the European Commission has been made, but our research has not revealed any evidence of any approval having been granted.

Two potential exemptions, the block exemption and the environmental protection exemption, could apply to this investment. However, both are subject to caps: the block exemption to a cap of €1.5 million and the environmental protection exemption to a cap of €7.5 million. The investment into the Alstom plants exceeds these amounts.

20 This scheme provides up to €35 billion of financing to projects funded jointly by the public and private sectors 'with high potential for the economy, with a focus on higher education and training, precisely, along with research, innovation and sustainable development' (EC 2011).

21 Generally speaking, state aid issues arise when the state confers any benefit or advantage (whether financial or not) on non-commercial terms which favours specific business activities and which could distort competition and trade between EU members.

Therefore, on the basis of publically available evidence, it would appear that the French government may have taken a calculated risk of having breached state aid rules with respect to the direct financing of the factories. Interviewees expressed some suspicion that this was likely to be the case, with one stating that they fully expected the rules to be enforced, eventually. Given that France has also been facing state aid proceedings in relation to the feed-in tariff it offers to support renewable energy development, it appears that the French approach to state aid is at risk of backfiring. The decision to investigate and enforce state aid rules lies with the European Commission, and it has 10 years to do so from the date that the aid is given. Uncertainty over whether such action will be brought and would succeed will remain until that date passes or until the French government takes remedial steps to obtain state aid approval from the European Commission.

Summary

The approaches taken by these three countries provide clear lessons for other countries, such as the UK. Denmark and Germany have provided a degree of policy certainty over a series of years for their wind industry, giving developers and suppliers alike the ability to plan for the long term. France took a proactive approach in order to secure local jobs but which did not rely on an explicit local content requirement. However, it is unclear whether their approach is in compliance with state aid rules so other countries would be wise to pause before providing financial support for the supply chain.

Both Germany and Denmark provide lessons for the adaptation of critical infrastructure. In Germany, the municipal ownership of ports meant they could be upgraded relatively quickly. In Denmark, where they are privately owned, the policy certainty outlined above ensured that ports were also upgraded, albeit over a longer time period. One final lesson lies in the integration between universities and government in Denmark in relation to enhancing skills and innovation – both are critical to cost reduction and job retention.

5. CREATING A VIRTUOUS CIRCLE FOR BRITAIN'S OFFSHORE WIND INDUSTRY

This report has set out the opportunities and risks presented by an expansion in offshore wind generation in the UK. As the previous chapter outlined, other countries such as Denmark, Germany and France provide a good example. We conclude that the UK is not yet fully embracing this opportunity. Indeed, it is pulling in two directions, pursuing a short-term dash for renewables in the current decade followed by mixed signals in the 2020s and the prospect of a drop-off in renewable deployment, including offshore wind. This approach fails as a climate policy, because we will not stay on track to decarbonise the power sector by 2030; it fails as an economic policy, because it reduces the potential for cost reduction in offshore wind; and it fails as an industrial policy, because our indecision risks scuppering a nascent industry and undercutting returns on our investment.

In this chapter, we will draw on the international examples, apply their lessons to the challenges facing the UK domestic supply chain, and set out a strategy to maximise the potential of the UK offshore wind market.

Creating an industrial strategy for the UK offshore wind supply chain

The UK government needs a three-point strategy in order to build a strong domestic offshore wind supply chain.

First, it needs to **attract at least two turbine manufacturers, preferably more**. While failure to do so would not be fatal to the prospect of a strong domestic supply chain, success would be a major boost, as these companies are able to attract a cluster of other companies further down the supply chain (as is the case in Denmark).

Furthermore, the political capital gained through attracting these companies, and the jobs they create, would engender a virtuous circle and breed greater support for the industry. Siemens and Vestas are the dominant firms but, as chapter 2 set out, they are not the only players in the market. Notwithstanding the fact that Siemens is publicly considering setting up a turbine assembly plant in Hull, it should not be the sole focus of attention. In particular, to help increase competition within both the European and UK supply chains, non-European companies should be targeted for investment in the UK.

Second, the UK must continue to **support and build upon its existing strengths in the supply chain**, as set out in chapter 3. Not only should the government be looking to support the burgeoning offshore wind industry but the UK also has huge stores of expertise and manufacturing capability in both the onshore wind and the North Sea oil and gas industry which can be built upon to provide further support to an offshore wind supply chain. Since offshore wind requires high levels of operation and maintenance compared to other renewable technologies, we should also build up these capabilities. One interviewee said:

> **'If you look at where the UK can most easily export talent and gain balance of trade benefits, it will not be in making steel and concrete and putting them in the ground, because most countries will want to put their arms around that – it is in exporting the expertise in developing, operating and constructing wind farms.'**

Third, the government should **support export opportunities for British firms as they build up their expertise** in the supply chain and related services. It should, therefore, favour coordinated action across the European Union and in the United Nations Framework Convention on Climate Change to extend the role of low-carbon

power, including offshore wind. Government agencies like UK Trade & Investment (UKTI) need to work with UK-based suppliers to encourage the use of their components in developments in other countries.

In order to achieve this strategy, the government should focus on six areas of policy set out below. Putting in place an appropriate framework with clear ambition after 2020, a smart procurement policy to incentivise local content at reasonable cost, and greater ministerial activism are all necessary conditions for the UK to maximise the benefits of offshore wind, but they are not sufficient. Upgrades to crucial infrastructure like ports and the grid, a coordinated and well-funded innovation strategy, and greater focus on skills will all help the UK to achieve its potential.

Key issue 1: clear ambition and policy certainty

Interviewees raised several problems with the lack of certainty provided by government policy. These included the lack of an effective transition process to keep deployment going through the middle of the current decade, the design of contracts for difference (CfDs) which appear to be badly prepared for the building of large projects like offshore wind farms, and a lack of long-term ambition to bring forward projects in the 2020s.

The Energy Bill, currently before parliament, introduces CfDs, which will replace Renewable Obligations between 2014 and 2017. It is estimated that poorly designed discretionary policy decisions could increase the cost of CfDs by up to 50 per cent (RWE 2013). The single biggest component of this cost pressure is the decision to issue CfDs for just 15 years, as opposed to the lifetime of the contract (ibid). Even without this pressure it is estimated that the government's subsidy pot, the Levy Control Framework, may have insufficient resources from 2017 onwards (PwC 2013). Industry is also concerned that the 'strike price'[22] for offshore wind has only been set to 2018/19, which is not long enough for suppliers to make location decisions.

Meanwhile, the lack of clarity around a market in offshore wind into the 2020s, as set out in chapter 2, creates a number of problems. First, without a clear statement of ambition into the 2020s, some developments would be economically unviable, due to the long lead times involved. One interviewee explained that if an order for offshore wind turbines was placed today then it would take three years to build the factory necessary for the development. After that point, in the absence of clear post-2020 ambition, only 2–3 years of future orders could be confidently expected. With the lease on a port site being at least as long as 15 years (see below) and one of the principal attractions of investing in the UK being proximity to the world's largest market, this represents an intolerable risk.

Second, confidence in the future development of the market is a prerequisite for the development of a stronger supply chain. Several interviewees explained that, if this was provided, they would be ready to 'press the button' on key projects, securing valuable jobs and tax revenues for the UK.

For example, one company told IPPR that they were considering whether to build a turbine plant in the UK – they have a deal with the local port but for the past two years have avoided making a commitment partly because of the uncertainty about demand for offshore wind after 2020. If a 2030 decarbonisation target was agreed tomorrow, this interviewee said, the company would go ahead with a UK turbine plant, employing at

22 The fixed revenue level for a unit of energy for generators.

least 1,000 people. An assessment of the contracts that it has lined up to support the plant suggests that, overall, if policy certainty improved, its projected turnover would grow from £1.5 billion to £3 billion by 2020 and the number of employees would rise from 6,000 to 10,000.

Third, a lack of certainty holds back companies that currently specialise in the supply chain for North Sea oil and gas from diversifying into offshore wind. This transition requires a change in business model in order to convert to offshore wind manufacturing, and so is unlikely to happen without greater policy certainty. One interviewee told IPPR:

> **'Offshore wind requires an entirely different approach to manufacturing than for oil and gas. Oil and gas structures are one-off, but for offshore wind you need an assembly line – you are making one foundation for a tower per week, not one a year. But for that you need a serial production operation and that isn't there yet in the UK. Once you have that then you can drive down costs.'**

Fourth, a lack of ambition in the 2020s will keep construction costs high. For example, the speed of turbine installation tends to increase significantly as projects progress (Crown Estate 2012b). It is estimated that offshore wind innovation has the potential to drive down costs by 25 per cent by 2020 and 60 per cent by 2050. This could lead to a saving of £45 billion in deployment costs over the period 2010 to 2050 (LCICG 2012). A separate study estimates that the costs of energy will be driven down by more than 15 per cent in real terms between 2011 and 2022. But it warns that:

> **'A reduction in government ambition or gaps in activity caused by planning delays would discourage investment by the supply chain and reduce innovation and competition. This could remove the cost reduction altogether.'**
> BVG 2011: 15

Fifth, policy uncertainty impacts on power prices for consumers. High levels of wind production would place downward pressure on spot power prices because of the low marginal cost of wind power production. This would in turn reduce consumers' energy bills: for example, it is estimated that the cost of power would have been approximately 4 per cent to 12 per cent higher in Denmark in the period 2004–07 if wind power had not contributed to power production (Krohn et al 2009). On a related note, a number of studies have suggested that, over time, the rising cost of gas due to higher wholesale and carbon costs will make a 'dash for gas' more expensive for consumers than developing a low-carbon energy system (CCC 2013, Cambridge Econometrics 2012).

Without a post-2020 volume commitment the UK will continue to face a 'worst of both worlds' scenario, with huge public investment in offshore wind during this decade leading to little in the way of British jobs and growth. Looking at Denmark, which has provided policy certainty for the wind market since the 1980s, and Germany, which has given quick and decisive policy certainty to support its wind market, it is clear that our key competitors in this market have taken an advantage.

Two policy developments were highlighted by interviewees as particularly important in reducing uncertainty around ambition. The first is the 'clean energy' amendment to the Energy Bill, which would introduce a target to decarbonise the power sector by

2030[23] – this was recently defeated in the House of Commons but is under discussion in the House of Lords. The second is an ambitious resolution to the current European Commission consultation on its '2030 framework for climate and energy policies'.[24] As would be expected, many in industry wanted to see the adoption of targets that give maximum policy certainty: in this case, the adoption of a renewable energy target for 2030 at the EU level. However, the strongest preference was for swift and decisive agreement. Any targets would need to be accompanied by an extension in the Levy Control Framework to 2030 to pay for low-carbon investment into the 2020s. The Committee on Climate Change (2013) has recommended that the Levy Control Framework should be extended to £10 billion per year.

The government has argued that the 2050 target to decarbonise the economy by 80 per cent against 1990 levels, as set out in the Climate Change Act 2008, should give sufficient certainty to industry about the trajectory of low-carbon energy in the UK. However, industry representatives rejected this notion and told us that further milestones were needed, particularly because of the perception of a 'twin track' energy policy within government.

Recommendations

- Contracts for difference must be designed to reduce cost pressure, which includes a role for longer contracts. It is important that strike prices are set for the total duration of projects (that is, for longer than 15 years).
- The UK government should adopt the 2030 'clean energy' target. The House of Lords still has an opportunity to amend the Energy Bill; however, if that fails, an incoming government should adopt the target immediately in order to provide certainty beyond 2020. DECC's central scenario should be amended as a result.
- The UK government should advocate for a new EU renewables target, or – failing that – for a low-carbon power target that is consistent with a decarbonisation of the sector to 50gCO_2/KWh by 2030. This would provide industry with the sense of ambition and certainty needed to bring down the cost, secure a domestic supply chain, guarantee a pipeline for export, and ensure that investment in offshore wind in the years up to 2020 is not wasted.
- The Levy Control Framework should be extended into the 2020s to pay for this low-carbon investment. Offshore wind should be eligible for framework resources so long as the industry meets its objective to bring the levelised cost down to £100/MWh for projects achieving a final investment decision in 2020.

Key issue 2: 'procurement' policy

The approach of the French government to its procurement shows that, when combined with a high level of ministerial activism, it is possible to structure a procurement strategy to secure local content. In the UK, by contrast, there is a liberalised energy market and the procurement of energy generation is carried out by energy suppliers, dominated by the 'big six',[25] rather than by government. As a consequence, procurement of energy generation (including offshore wind) is not subject to EU procurement rules. In contracts

23 At the time of writing, government has delayed setting a 2030 decarbonisation target for the British economy until 2016.

24 At the time of writing, UK energy secretary Ed Davey has expressed support for an EU decarbonisation target of a 40 per cent reduction of carbon emissions from 1990 levels, with an 'ambition' for it to be extended to 50 per cent when the agreement is reached in 2015. He is, however, opposed to a new renewables target.

25 The 'big six' are British Gas, E.ON, EDF, NPower, Scottish & Southern Electric and ScottishPower.

for difference, however, the government does have a potential lever that it could use to support the UK offshore wind supply chain in lieu of direct procurement. And, regardless, EU state aid rules apply.

The French case study outlines that the attitude of their government to state aid is the polar opposite of perceptions of the UK government's attitude. France has not received approval from the European Commission for the state aid it has provided to the industry. If they do not receive state aid approval then a funding gap may open up beneath the new factories. Nonetheless, their government has been willing to take on that risk.

Although Britain might not want to replicate the French approach, state aid rules should not present a barrier to the UK government providing financial support for the industry. Indeed, the government already provides financial support to industry through existing schemes such as the UK Guarantees Scheme (see below). Instead of being used as an excuse for inaction, state aid needs to be approached sensibly and with an understanding that approval, if necessary, may take time to materialise.

In this light, policymakers need to consider what should be required of developers to support the growth of the UK supply chain. There have been some suggestions that a mandatory local content requirement[26] should be introduced for the development of offshore wind farms. However, our interviewees expressed concern about this.

First, the supply chain remains in its infancy. Pressure to increase domestic manufacturing capacity could be detrimental to achieving the goal of reducing the cost of offshore wind to £100/MWh because it might lead developers to buy more costly components. As one interviewee told IPPR:

> **'We are only going to get cost reduction if we ramp up the amount of offshore wind we are building – so in the initial phase you will have to be prepared for us to go wider in our search for content but that will then enable the large developers to say, "right we can now see the route to 2GW per year and that's enough to start the process off".'**

Second, there is no agreement yet about how technically to define local content. If a turbine is assembled in Britain but includes parts made in other countries, is it 100 per cent domestic? How far down the supply chain should the assessment be made? Should service providers such as surveyors, lawyers and accountants be included in the assessment?

Third, local content requirements would almost certainly fall foul of the WTO's rules[27] as a restriction on free trade, and quite possibly of the EU's as well, for the same reason.[28]

26 That is, that a certain percentage of an offshore wind farm must be manufactured in the UK.

27 WTO rules prohibit 'any internal quantitative regulation relating to the mixture, processing or use of products in specified amounts or proportions which requires, directly or indirectly, that any specified amount or proportion of any product which is the subject of the regulation must be supplied from domestic sources'. It has recently ruled against Ontario, Canada, which had legislated that goods and labour from Ontario must account for 60 per cent of supply costs at clean power projects, depending on the type of renewable source.

28 Article 34 of the Treaty on the Function of the European Union states that 'Quantitative restrictions on imports and all measures having equivalent effect shall be prohibited between Member States.' The words 'measures having equivalent effect' have been given wide interpretation by the European Court of Justice. For example, they ruled against Ireland, which ran an advertising campaign to encourage the Irish to buy Irish-made products. It is likely that a local content requirement would be deemed to be a measure having an equivalent effect to a trade tariff.

Nevertheless, the UK must continue to have high ambition for the level of local content in the supply chain for UK offshore wind farms, so long as it is not a 'hard' prerequisite to a successful bid. Although the full terms and allocation process for CfDs have yet to be established, the government has recently announced the allocation criteria for investment contracts to be awarded under the final investment decision enabling programme29 (DECC 2013b). Although the timescales mean it is unlikely that any planned offshore wind projects will be eligible for these investment contracts, their allocation criteria provide an indication of the government's thinking about the allocation criteria for CfDs.

Encouragingly, 25 per cent of the weighting for investment contracts will be allocated to the planned project's impact on the industry's development, including the supply chain. The remaining 75 per cent of weighting is allocated to the deliverability of the project.

However, criticisms of this new approach can still be made. First, no minimum threshold is allocated to the industrial development criteria. It is therefore possible for a development to be awarded government support without having any meaningful impact on the industry's development. Second, this new criteria does not require developers to take account of the impact of their project on the social wellbeing or environment of the communities closest to the area of operations.

Recommendations

- DECC should include a requirement that developers applying for a contract for difference should have to demonstrate how their proposed development might bring 'socioeconomic value' to the local area – that is, how it might improve the economic, social and environmental wellbeing of the communities close to the proposed development and how that improvement will enhance the success of the development.
- DECC and potential bidders should liaise with local authorities, local enterprise partnerships and other relevant bodies in the local areas most affected by the construction of an offshore wind farm to ensure that they have a full understanding of the social, economic and environmental needs of that area. Local authorities should confirm their agreement with DECC's assessment of the socioeconomic value that developments bring to their local community.
- Bidders who are able to offer developments that bring more socioeconomic value to the local community should be awarded contracts for difference in priority to other bidders.

Key issue 3: ministerial activism

Once the right rules are in place, government ministers have an important role to play in pushing for investment in the UK. In doing so, they must ensure that they speak with one voice.

The strong ministerial push in France led directly to Alstom agreeing to build four factories. It shows that, to build a strong supply chain, there is a need for activism from ministers charged with executing policy. Similarly, the UK's own industrial history is littered with examples of ministerial activism leading to major industry players setting up shop in the UK. Nissan would never have come to the north east without encouragement

29 This programme is designed as a transition measure for projects due to begin development in the period up to the award of the first CfDs. The investment contracts are intended to be very similar to CfDs but bespoke to the development in question.

from Margaret Thatcher. The decision by Hitachi to build a train manufacturing plant in Newton Aycliffe was a direct result of a strong push for that decision by Lord Adonis in his role as transport secretary.

In engaging with foreign potential investors, there should not be a focus purely on attracting the existing European turbine manufacturers, such as Siemens and Vestas, to set up an installation in the UK. Government ministers should also reach out to Asian manufacturers looking to get a foothold in the European supply chain. The Asian offshore wind market is currently very small compared to Europe's: as of October 2012, 86 per cent of offshore capacity in development was in Europe, with only 5 per cent in China and 4 per cent in South Korea (Navigant 2013). However, China is the world's largest onshore wind market, having installed 15.9GW in 2012.

Setting up in Europe would require Asian offshore wind manufacturers to expand into the offshore wind market, target the European market and set up new manufacturing facilities on this side of the world. With many Asian firms such as Samsung and Mitsubishi venturing into this sector, there is potential for these firms to be attracted to the UK, with its large offshore wind market on offer.

In its discussions with industry, government must ensure that it is speaking with one voice. Interviewees told IPPR that they had a high level of engagement with both BIS and DECC but that the quality of contact with HM Treasury and its ministers was much lower. They had a strong sense that HM Treasury was blocking major decisions, particularly around any post-2020 ambition.

One interviewee told us:

> **'We are getting very good ministerial engagement in BIS and DECC but Treasury is a hard nut to crack. We do meet them but Treasury's energy team is very small. BIS has been very proactive under both Labour and the Conservative government and DECC is also very good. Somebody needs to pull it all together.'**

Another said:

> **'Our conversations with BIS and DECC are not so much what they can do for business and more about what business can do for government. UKTI are much more proactive and are looking for solutions. Treasury don't want to talk at all.'**

This lack of joined-up government support for the industry, reflective of the lack of policy certainty outlined above, is a material concern within the offshore wind industry.

Recommendations

- Ministers should work tirelessly and consistently to encourage those turbine manufacturers and other investors that are seriously considering setting up facilities in the UK to do so.
- If, at the same time as clarity was provided on post-2020 ambition, an announcement on a turbine factory could also be made then that would send a strong signal that the UK was open for business in the next decade and prioritising local content without recourse to 'hard' targets.
- If HM Treasury wants to play an active role in UK energy policy, it should engage with developers and suppliers so that they can make their case directly to the department.

Key issue 4: critical infrastructure

Greater ambition and a proper procurement policy are necessary conditions for securing a strong domestic supply chain, but they are not in themselves sufficient to support the industry. Improving ports and grid infrastructure is crucial for the development of both the supply chain and the wider offshore wind market.

Ports

Some of the UK's existing ports and harbours will have to significantly adapt their business models and physical attributes in order to contribute to any increase in offshore wind development. New coastal assembly and manufacturing facilities will be needed when the developments currently being planned eventually begin construction, due to the greater demand anticipated and because the sites of these new projects are further from the shore and in deeper waters. The UK has at least 20 ports that could be used by the offshore wind industry, but 'super-hubs' will need to be developed on these sites to accommodate the increased demand (BVG 2009).

In Germany, where ports are owned and administered by local municipalities, it has been comparatively straightforward for municipalities to initiate upgrades, and the prospect of local job creation has encouraged this. Land has been made available at lower rates and on short-term leases – sometimes as short as a month. In Denmark, the upgrades required to ports have happened organically over time, without government support.

In the UK, ports are privately owned, meaning that government will need to work with owners to provide a solution to the challenge of upgrading port infrastructure. Failure to do so has been identified as a key risk factor in potential UK jobs being lost to European markets (UKCES 2011). Most ports will have to change their business models to accommodate offshore wind – as a result, they are demanding longer-term leases of 15 years and more, which is far greater than in other markets. Developers have been reluctant to sign up on these terms.

Government has identified this challenge and already offers support to UK ports to achieve this transition, in two forms. First, both Westminster and Holyrood offer capital funds of up to £60 million[30]and £70 million[31] respectively for the conversion of ports to offshore wind manufacturing. However, compared to the subsidies available through the Levy Control Framework up to 2020, these are very small amounts of money. Second, the government has set up the UK Guarantees Scheme. This has been made available up to the end of 2014, provides state guarantees of up to £40 billion cumulatively for critical infrastructure projects and, if utilised, could reduce the costs of financing upgrades to ports.[32]

The government has been working with the ports to promote the UK Guarantees Scheme, and told IPPR that ports have been expressing interest. PD Ports in the North East and Peel Ports in Liverpool are among those which have publicly expressed their interest in making the transition (CEP 2013, Peel Ports 2012). Several key players in the supply chain – including Gamesa, Siemens and Samsung[33] – have all publicly declared interest in investing in British ports (BVG 2012), with Siemens close to reaching a deal with the Port of Hull.

30 https://www.gov.uk/government/news/offshore-manufacturing-sets-sail-for-uk-ports

31 http://www.businessgreen.com/bg/news/1870045/scotland-launches-gbp70m-ports-fund-trigger-renewables-revolution

32 http://www.hm-treasury.gov.uk/iuk_uk_guarantees.htm

33 Vestas had also declared interest but has since withdrawn their support.

Interviewees told IPPR that, using government support, commercial solutions were in development. However, a deal between a UK port and an offshore wind manufacturer has not yet been signed. The progress of any negotiations is commercially sensitive, but interviewees told IPPR that neither manufacturers nor port operators were willing to invest in port upgrades until policy certainty, of the kind outlined above, has been provided. Some interviewees suggested that interest was more likely to come from port owners based in the UK, as foreign owners tended to take a shorter-term view on their investments in UK ports.

Recommendations

- Policy certainty is critical to ensuring that the owners of Britain's ports and links in the offshore wind supply chain agree to carry out the necessary upgrades in preparation for an increase in offshore wind deployment. With this in place, ministers should prioritise the closing of deals between ports and offshore wind manufacturers. If necessary, they should intervene directly, sitting in on negotiations and promoting the incentives offered by government.
- Finally, government should develop a 'plan B' in case there is a market failure. This could involve the leasing of port infrastructure in order to sublet it to offshore wind industry at commercial rates on short-term contracts. Nationalisation could be considered if there were significant state aid issues with the leasing option.

Grid infrastructure

Grid infrastructure is another area of significant concern. Interviewees remarked that there had been some improvements in securing early investment in offshore transmission from the National Grid's RIIO process[34] but that offshore transmission still represents a risk for developers. Key concerns have been summarised by the Crown Estate (2012) as:

- issues related to the Offshore Transmission Owner (OFTO) regime,[35] both in terms of allocation of risk and cost-recovery uncertainty
- concerns related to the emerging regulatory regime designed to encourage greater coordination in transmission.

The last of these is the most serious. Industry is seeking reassurance that the UK will develop a roadmap for offshore power generation that will move away from inefficient and costly 'point-to-point' connections from a single offshore wind farm to the shore and towards sharing transmission assets.

Offshore wind farms are often developed in phases which can be constructed one after the other. In time, all the different phases are linked to each other and share the transmission cables back to shore and the electricity transmission system. However, this means that the first developer must be prepared to take the risk that future phases may not be built. This would leave that developer with an isolated wind farm with only one connection to shore rather than multiple connections through other developments. This developer could choose to price this risk into their business model, which in turn would have an impact on the levelised cost of offshore wind generation. Alternatively, they may simply choose not to prepare for the future opportunity to share infrastructure, which means that these developments are potentially less economical and technically efficient than they otherwise could be. One interviewee told IPPR that the latter option was being chosen by most developers.

34 National Grid's RIIO (Revenue = Incentives plus Innovation and Outputs) review is an assessment by the company of realistic investment and future finances. See http://www.nationalgrid.com/NR/rdonlyres/37D400CE-425C-4FFB-9D75-88B618935BCB/52208/RIIO_A4120309_v3.pdf

35 Ofgem recently established a new regulatory regime for offshore transmission networks. A key part of the regime is the grant of offshore transmission licences for 'offshore transmission owners' on the basis of a competitive tender process.

This risk could be passed to the onshore transmission operators, who could choose when to pay for the necessary connections. However, there is no calculation as to how that transfer of risk might result either in a lower levelised cost of offshore wind energy or increased transmission charges to network users including suppliers, who may in turn choose to increase consumers' bills.

Recommendation

- The transmission operators, Ofgem and the Offshore Wind Programme Board should carry out a costing of this risk. This would inform and assist in moving towards a consensus on where the risk of speculative investment in future transmission requirement should lie. If it concludes that it is better overall for the consumer that risk lies with the transmission operators then Ofgem should strongly consider relaxing regulations. This would allow these companies to make investments speculatively instead of only being able to make grid investments as and when the need arises.

Key issue 5: innovation

Successful innovation will be crucial to reducing the cost of offshore wind to the government target of £100/MWh or below. The Offshore Wind Cost Reduction Task Force has identified three key innovation priorities:

- standardisation of all aspects of deployment and development of offshore wind farms
- recommendations to improve the consenting to and leasing of test sites
- identification of options for and recommendations on how to deliver additional testing sites (OWCRTF 2012).

Improving the efficiency of turbines, providing foundations for depths of greater than 30 metres, technological improvements to nacelles and array cables, and developing improved processes and techniques for installing, operating and maintaining wind farms were all highlighted over the course of our research.

The Low Carbon Innovation Coordination Group,[36] which has responsibility for coordinating public sector funding and delivery of innovation in low-carbon industries, has calculated that innovation alone could reduce the cost of offshore wind by 25 per cent by 2020 and 60 per cent by 2050. Together with savings in the supply chain and financing, this could reduce the cost of energy to about £100/MWh by 2020 and £60/MWh by 2050 (LCICG 2012).

In addition to the initiatives carried out by industry, the government provides a wide range of innovation support. For example, the Offshore Renewable Energy 'Catapult' centre is funded with £10 million a year of public money through the Technology Strategy Board but has yet to begin work. Interviewees suggested that it was unclear how the Catapult would fit alongside other forms of innovation support, including the Energy Technologies Institute, Growth Accelerator, and advanced manufacturing Catapult.

There is clearly a lack of strategic coordination of advanced research in this area. This is consistent with other sectors in the UK, which also tend to have much lower levels of innovation funding than that provided by the UK's international competitors (IPPR 2013). IPPR has identified inefficiencies in the current UK spending allocation for innovation, and

36 Membership of this organisation consists of the Department of Energy and Climate Change, the Department of Business, Innovation and Skills, the Engineering and Physical Sciences Research Council, the Energy Technologies Institute, the Technologies Strategy Board and the Carbon Trust.

advocates a reallocation of approximately £1 billion per year. Funding from a 50 per cent decrease in the 'patent box' tax rate, a 20 per cent reduction in the R&D tax credit, and by increasing the 4G annual licence fees in line with the market value of spectrum would be used to increase funding for applied research and innovation centres, including the Offshore Renewable Energy Catapult, by a factor of 20 (ibid).

Recommendations

- The Offshore Renewable Energy Catapult should be expanded into an applied research and innovation centre for offshore renewable energy with additional funding reallocated from existing, inefficient innovation schemes.
- In the interim, the Offshore Renewable Energy Catapult and the Offshore Wind Programme Board must urgently work with the Crown Estate to map out the current innovation being done in the UK and identify how the Catapult can best use its existing resources to plug gaps in the sector's innovation strategy.

Key issue 6: skills

As well as being a centre for innovation, Britain also needs to develop a strong skills-base in offshore wind power generation. The poor supply of skills has long been recognised as a barrier to the development of a strong UK supply chain; at the same time, the offshore wind sector is competing with other sectors, including the oil and gas industry, to recruit and retain skilled staff.

According to some accounts, 'skills' has been identified as the third-greatest barrier to success (Boettcher et al 2008). Failure to have these skills at home will necessitate awarding contracts to overseas providers. Most in demand will be skilled trades (occupations traditionally associated with levels 3 and 4 vocational and apprenticeship training) and roles requiring higher-level skills (graduate and post-graduate education) (McNeil and Silim 2012). Cognisant of this potential shortage, RUK set up the Renewables Training Network (RTN) with funding from industry and the UK Commission for Employment and Skills.[37] It aims to bridge the skills gap by developing training courses with various stakeholders and providing a 'quality assurance kitemark' to courses offered by third-party providers.

Denmark illustrates the clear link between the development of a strong domestic skills-base and innovation both in industry and at universities. With so much innovation required in the future, there is clear scope for a combined approach to be followed in the UK. The RTN is an important first step in this regard.

Yet the focus of innovation has been on reducing the leveraged cost of offshore wind rather than on developing a UK skills-base. The development of skills falls outside the scope of the Crown Estate's cost reduction study, the LCICG's report and the work of the Offshore Wind Cost Reduction Task Force. Although the Offshore Renewable Energy Catapult's website does recognise the development of skills as being important to its work[38] and universities such as the University of Dundee, the University of Aberdeen and Robert Gordon University have undertaken their own initiatives[39] there is a risk of a strategic mismatch between innovation on one hand and skills development on the other.

37 http://www.renewableuk.com/en/our-work/skills-and-employment/renewables-training-network.cfm
38 https://ore.catapult.org.uk/skills;jsessionid=50C066E2DA2F01E9996D2EE216EEC76F.2
39 http://renews.biz/42092/universities-launch-offshore-institute/

Recommendations

- The Offshore Wind Programme Board and the Offshore Renewable Energy Catapult should ensure that the development of skills is re-prioritised. Particular attention should be paid to fostering and developing partnerships between industry and other universities and other educational institutions.
- As part of demonstrating how they will bring 'socioeconomic value' to a local area, developers should consider sponsoring courses in university technical colleges[40] and further education institutions. Employers in the offshore wind industry should also take on more apprentices.
- BIS should take responsibility for assessing the quality of skills development and ensuring that training offered in the UK is likely to meet the future needs of the offshore wind industry as a whole.
- The LCICG should consider inviting the Department for Education to become an associate member to ensure that the development of a UK skills-base is also a focus of that body.

40 University technical colleges specialise in teaching 14–18-year-olds subjects that require technical and modern equipment, including engineering, product design, construction, and land and environmental services.

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