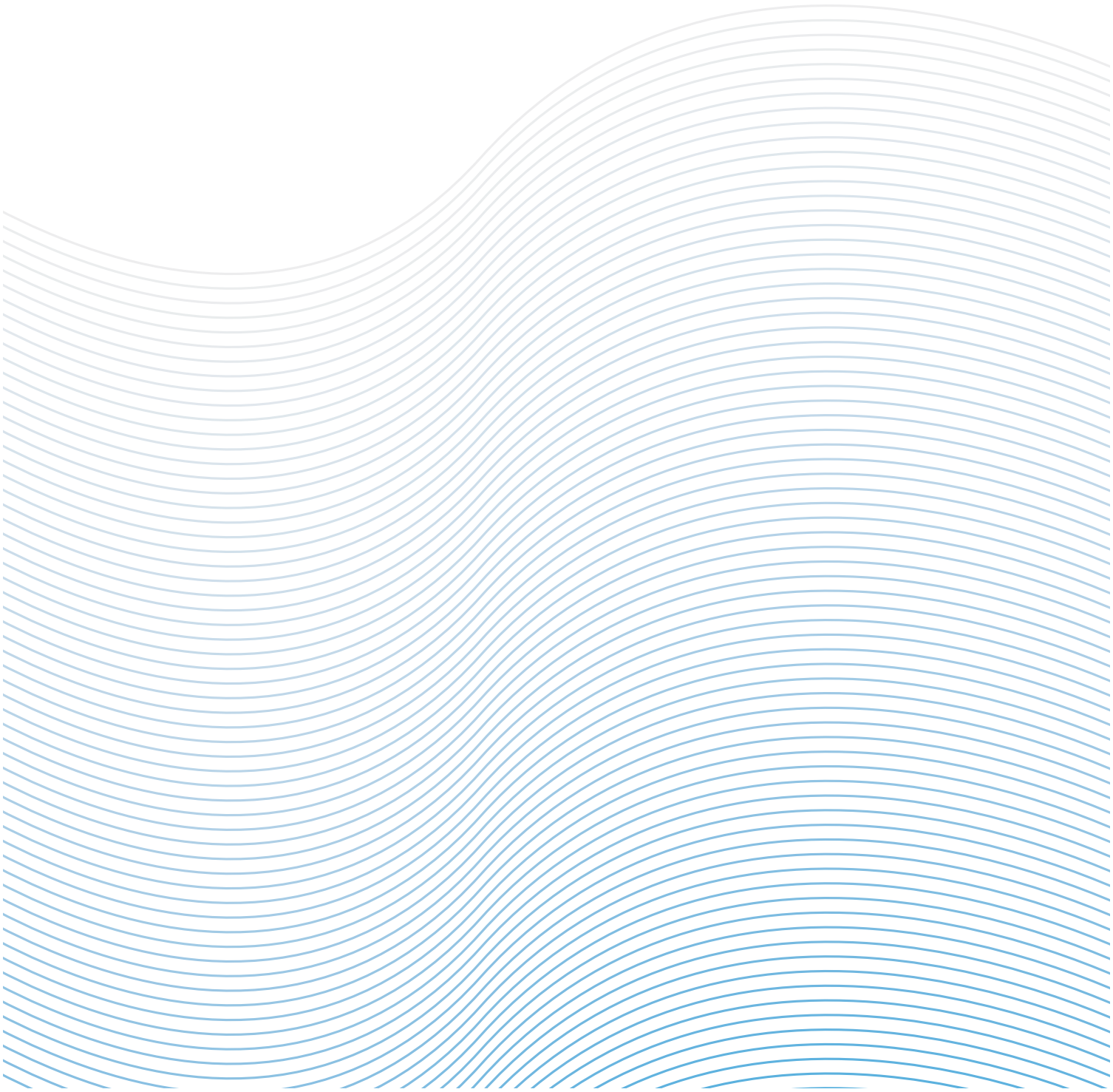
Offshore Wind Cost Reduction Task Force Report

June 2012



Acknowledgements

I would like to thank all members of the Offshore Wind Cost Reduction Task Force for lending their considerable expertise and time in producing this report, and also the teams at DECC and RenewableUK for their valuable assistance. We took evidence from an extensive range of parties, listed here, and I thank them for their contributions.

Andrew Jamieson,
Chair, Offshore Wind Cost Reduction Task Force

Climate Change Capital
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Department for Environment, Food and Rural Affairs
DONG Energy
Low Carbon Finance Group
Morgan Stanley
National Grid
Infrastructure Planning Commission
Planning Inspectorate
RenewableUK
Scottish Enterprise
Scottish Government
Scottish Water
SSE Renewables
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The Carbon Trust
The Crown Estate
UK Green Investments

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Ministerial Foreword

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The UK is the global leader in offshore wind. We have an amazing wind resource and are rightly seeking to take best advantage of it. We have the world's biggest wind farms at all stages of production, including operation, construction, and in planning.

Our success will contribute to the UK's security of supply, and help insulate consumers from the volatile prices of imported fossil fuels. It will also help reduce our carbon emissions in the effort to combat climate change. In addition, seizing the economic opportunity it represents will attract investment and help rebalance the economy, bringing high-value manufacturing jobs to locations across the UK.

There are a number of challenges to overcome to ensure that offshore wind fulfils its potential. Possibly the single most important challenge is **cost**. There is potential for significant cost reduction – which also provides an opportunity for the UK to develop an area of competitiveness in a growing global industry, and ensures costs for bill-payers are minimised. That is why, in the UK Renewable Energy Roadmap (July 2011), the Government established an industry-led task force to produce a path and action plan to get the cost of energy down to £100/MWh by 2020 (equivalent to 10 pence per unit). And the Roadmap stated that if costs could be reduced in this way, there was potential for up to 18GW of offshore wind to be installed in the UK by 2020.

We are therefore delighted to welcome this very important report. It highlights a number of areas where industry action can lead to very significant cost reduction, including through building alliances, strengthening the supply chain and fostering innovation. The aim is stretching, but this report shows that it is also achievable. This conclusion is founded on detailed evidence, provided largely by The Crown Estate's analytical work. The recommendations are clear, action-oriented and achievable, and we are delighted that industry is showing such commitment to this vital task. As the industry delivers on these actions, offshore wind will cement its position as a competitive, low-carbon energy resource, and attract jobs and investment across the UK.

All four governments across the UK are committed to working in partnership with industry and others to create the conditions to allow the sector to thrive. As the industry takes action to bring down costs, Government will also act to ensure that the "enablers" such as transmission networks, the planning system and financial support mechanisms are in place. We are committed to getting these right to provide the industry with a strong base for the work that developers, suppliers and others are keen to take forward.

Both Government and industry are committed to the UK being the global leader in offshore wind safety. Nothing in this report is about corner cutting or short cuts. Indeed, many of the areas in which recommendations are made, such as more reliable turbines requiring fewer maintenance visits, will be good for both cost reduction **and** safety.

This report is a great first step. Government looks forward to working with industry to deliver its recommendations and support UK offshore wind in achieving its full potential both up to 2020 and beyond.

Executive Summary

Andrew Jamieson,
Chair of the Offshore Wind Cost Reduction Task Force

We have, in offshore wind power, an opportunity not seen in the UK for many years to create a sustainable and competitive industry, employing thousands of people in its construction and operation over decades to come. It will provide a significant proportion of UK electricity usage from clean, green sources and contribute enormously to our security of supply.

In July 2011, the Government made it clear in its UK Renewable Energy Roadmap[1] that the cost of electricity from offshore wind would have to fall significantly by 2020 if we are to fulfil our ambitions, amounting to some 18GW of capacity. I was then asked by the Government to draw together an Offshore Wind Cost Reduction Task Force (CRTF) of experienced industry practitioners to consider ways in which costs could be reduced, with a £100/MWh target cost of energy by 2020.[2]

Based on the evidence gathered and assuming our recommendations are followed, the CRTF concludes offshore wind can reach £100/MWh by 2020.

Wherever possible the CRTF has taken evidence of best practice, from both within and outwith the electricity sector, and especially that of the UK's offshore Oil and Gas sector (O&G). We also considered, in particular, evidence as it emerged from the comprehensive Offshore Wind Cost Reduction Pathways Study (TCE Study)[3] published recently by The Crown Estate, with whom the CRTF has worked very closely.

From my extensive discussions within the CRTF, and with many others within or associated with the industry and in Government (UK and devolved administrations), I am strongly encouraged by the willingness of all parties to see the UK succeed in delivering its offshore wind ambitions.

There is much to be encouraged by: we have a Government with a firm commitment to renewable energy growth, and in many respects with policies more stable than elsewhere in the world; a landowner, in The Crown Estate, which acts responsibly with its clients and has delivered a great many enabling actions to further industry's progress; and a committed and innovative offshore wind industry looking to overcome challenges and deliver new low-carbon electricity that best uses our natural and abundant wind resources, and which is also seeking where possible to provide economic prosperity via new jobs and skills.

Despite such a positive outlook more needs to be done. We have gaps in our delivery schedule over the next few years, and costs have been rising. The supply chain can be constrained and is often hesitant to increase capacity. Financiers find construction risks unattractive and, even though investment continues to flow, the industry's prospects are under constant scrutiny. Regulatory and incentive mechanism reforms continue to be seen as major risks and project developers/owners are reluctant to invest more than is strictly necessary to meet immediate consenting needs, often to the neglect of other transforming actions required to propel growth.

We also recognise that the years to 2020 present a short timescale to overcome significant challenges to the sector's costs, and require the industry to cut costs faster than would otherwise occur naturally. Cost reductions need to get underway now, as we cannot afford to wait for changes to projects far off in the pipeline.

1. DECC (July 2011), UK Renewable Energy Roadmap, http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/re_roadmap/re_roadmap.aspx

2. Defined as the levelised cost of energy at £100/MWh from a range estimated at £149–191/MWh today, as given in the 2011 UK Renewable Energy Roadmap

3. The Crown Estate (June 2012), Offshore Wind Cost Reduction Pathways Study, http://www.thecrownestate.co.uk/energy/offshore-wind-energy/working-with-us/strategic-workstreams/cost-reduction-study/

Our review of the main cost issues and what can be done is therefore timely.

It is intuitively obvious that the following will reduce costs:

(i) a stronger and more consistent project pipeline with minimised fallow periods would allow confidence in the supply chain to improve, avoid downtime costs and allow the industry overall to learn, innovate and develop best practice more rapidly;
(ii) an increased supply chain capacity with a greater number of new entrants would improve price competition; and
(iii) a supportive policy climate with continued and demonstrable political support would improve investor confidence, in turn offering cheaper finance and a greater appetite to invest in projects and infrastructure more dynamically in anticipation of market need.

We looked closely at why such prerequisites are not currently being met – whether in actual fact or as perceived by stakeholders.

Further, we have chosen to address what the CRTF considers the most prominent issues that are contributing to cost. There are other issues affecting the future health of the sector, such as the availability of skills and labour. We conclude that many such other risks are already known to industry and Government, and that as activities to address them are underway we do not consider them to be within our scope.

Notably, the need for success in the Government's Electricity Market Reform,[4] and the issues such reform is creating, became a topic that was raised frequently in all of our meetings. It is clearly critical that we have the right market framework in which to invest. There is a risk of creating a market hiatus that could be fatal to investor appetite. We recognise there is a great deal of engagement and discussion across Government and industry elsewhere on this matter and we consider its details therefore to be largely out of our scope. However, many aspects are inextricably linked, particularly when we address prospects for funding, and we ask Government to pay particular attention to the design of Electricity Market Reform vis-à-vis our recommendations in this report.

The CRTF's priority is to consider how costs can be reduced. The UK has a great deal to offer in providing the right opportunities for manufacturing and employment in many areas of the supply chain, and less so in other areas. However, where there are opportunities to serve our market and those of the rest of Europe and potentially elsewhere in an economic manner then we should seize them.

The key recommendations of our report are detailed on pages 6–7.

I want to give particular prominence to two of them here:

1. Industry to Re-evaluate its Contracting Structures

With 1.86GW of offshore wind fully installed across 14 project sites, the UK is at the leading edge of global offshore wind (RenewableUK, UKWED).[5] However, projects have had mixed success as regards programme delivery and reliability, and costs in general have been increasing. We have considered much evidence, notably from the Oil & Gas sector and large-scale electricity contracting in transmission, that suggests a more inclusive and collaborative approach between developer and supply chain could deliver significant cost reductions. Generically known as "Alliancing", such ways of working come in many forms, from early and informal supply chain involvement in project design to a more fully collaborative and autonomous project structure that empowers participants to manage issues and processes more effectively to reach project cost targets. The CRTF considers there is scope for many such practices to be adopted by the offshore wind sector. We recognise, however, that there are currently many impediments to being able to do so as effectively as other sectors, notably the supply chain constraints and the evolving nature of newer and larger turbines that are not yet commercially proven and whose prices are not yet at the contract stage.

We therefore also recommend in our report how such impediments could be addressed.

Nevertheless the evidence to us is clear – the industry can do much to help itself in this respect. If it chooses to address the cultural issues associated with such new ways of working and if it chooses to work more collaboratively and innovatively, vertically and horizontally across the supply chain, and with competitors on non-competitive matters, then it can reap significant cost savings.

4. Further information on Electricity Market Reform can be found at http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/electricity/electricity.aspx

5. http://www.bwea.com/ukwed/

2. Establishment of a new Offshore Wind Programme Board

As stated above, there is much that is good happening across industry, Government and stakeholders to address and resolve issues that affect the delivery of offshore wind. However, much of that is not transparent or coordinated within the industry and sometimes within different departments of the public sector. Issues are sometimes only addressed late in the day when it becomes critical to do so. This is not conducive to attracting new entrants, or to improving investor confidence. Further, all too often reports such as this one run the risk of sitting on a shelf with no ownership of the action points.

We therefore propose a new Offshore Wind Programme Board (OWPB), comprising a small number of senior representatives of the industry, Government and Statutory Nature Conservation Advisors. This model is based on successful groups elsewhere within the electricity and other sectors, for example: the Scottish Government's Offshore Wind Industry Group,[6] O&G PILOT[7] and the Aerospace Business Leaders Group.[8] Its objective would be to regard the UK's offshore wind sector as one business, proactively consider its risks, whether created by regulation or industry practices, and assign the appropriate participants to work on solutions to the issues raised. It would also review progress on the actions recommended throughout this report. Its discussions would be private and take place with a spirit of openness and collaboration, but the conclusions would be public. It would report, initially at least, to the Offshore Wind Developers' Forum, which is co-chaired by the Energy Minister and a senior industry representative. The OWPB should be established by autumn 2012, and evaluate and address risks on a frequent basis throughout each year. In working successfully, the OWPB should be seen as a catalyst to improving sector confidence.

Health & Safety

It is also important to note that the CRTF has paid particular attention to ensuring the Health & Safety of our industry remains paramount throughout this cost reduction period. I am confident that the recommendations made to improve industry best practice on cost, in particular those mentioned above that give closer opportunity to improve project processes, design and operational practice, offer excellent opportunities to enhance best practices in Health & Safety.

Conclusion

The combined evidence of The Crown Estate's Offshore Wind Cost Reduction Pathways Study and of the information the CRTF has gathered and evaluated shows that the offshore wind levelised cost of energy can be reduced to £100/MWh by 2020 if there is sufficient project momentum, supply chain competition and stronger intra-industry and stakeholder cooperation. The barriers are definitely surmountable, and our report recommends ways of tackling the largest of them.

With this and the continued determination of all parties, the UK offshore wind sector should be able to deliver the vast quantities of low-carbon electricity the country needs in an affordable manner, while providing thousands of jobs and being an engine of growth for decades to come.

6. http://www.scotland.gov.uk/Publications/2010/09/28115850/0

7. http://www.decc.gov.uk/en/content/cms/meeting_energy/oil_gas/pilot/pilot.aspx

8. http://www.bis.gov.uk/policies/business-sectors/aerospace-marine-and-defence/aerospace-overview/aerospace-innovation-and-growth-team

Table of Key Recommendations

Overarching Recommendation	
1	Establish an industry/Government Offshore Wind Programme Board (OWPB), which will initially report to the Offshore Wind Developers' Forum (OWDF), to address issues affecting offshore wind development proactively to avoid unnecessary delay in delivery - membership should go beyond developers and DECC, to include supply chain and other key Government departments and Statutory Nature Conservation Advisors.
Supply Chain Recommendations	
2	The OWPB to lead the establishment of a strategic supply chain risk register by autumn 2012, to map key supply chain bottlenecks.
3	Government needs to urgently increase its direct engagement with companies that have the capability of entering the offshore wind supply chain, to reduce potential bottlenecks. Engagement should be dedicated and focused. Working with industry, it should identify barriers preventing investment, such as access to finance, and examine what can be done to help individual companies enter the market.
4	RenewableUK/developers, through the OWPB, to build on the existing development of an online project timeline chart to provide better and more detailed project visibility. Developers, through the OWPB, to develop an engagement strategy for communicating opportunities to the lower tiers of the supply chain, using best practice identified from other sectors. To be completed by the end of 2012.
5	Government should put in place a mechanism to target and support Small and Medium-sized Enterprises (SMEs) to diversify, and provide advice towards the tender pre-qualification stages.
6	Government should seek to secure the investment of as many turbine manufacturers as possible, to meet early Round Three timelines, using the tools that it has available. Support should be made available to help companies manufacturing key Tier 1 or 2 supply chain components.
Innovation Recommendations	
7	A Standardisation Body, operating at a technical level through the OWPB, to be created to examine and recommend areas for standardisation across all aspects of wind farm development and deployment. The OWPB should explore, with the Offshore Renewable Energy Catapult Centre, how this work would be undertaken by autumn 2012.
8	Future onshore and offshore test sites, including testing on commercial projects, need to be delivered expediently and efficiently. Initially, RenewableUK/The Crown Estate should deliver a best-practice workshop to capture and build on lessons learned from current processes (and projects) for leasing and consenting of test sites, and produce recommendations and actions for the OWPB to act on, with industry and Government, by the end of 2012.
9	Based on The Crown Estate's gap analysis of the availability and determined need of onshore and offshore test sites to meet initial early timelines for Round Three deployment, the OWPB should by the end of 2012, identify options and provide recommendations on how additional testing capacity can be quickly delivered.
Contracting Strategies Recommendations	
10	Evidence suggests strongly that Alliancing approaches have driven down costs in other sectors. Developers should seek to adopt such approaches, and we suggest the OWDF initiates an action plan with senior management across the industry by autumn 2012.
11	A Common Knowledge Forum of senior industry practitioners should be established by the end of 2012 to identify best practice and models to help companies seeking to adopt new contracting strategies.
12	The Common Knowledge Forum should seek to standardise processes, technology and contracts where appropriate, to facilitate companies adopting this model.
13	The Common Knowledge Forum would continually seek to identify and address barriers that prevent offshore wind going further along an Alliancing model.
Planning and Consenting Recommendations	
14	The OWPB should monitor, as a standing item at each meeting, implementation of changes to the consenting process, informed by industry review of their effectiveness.
15	The OWPB should monitor, as a standing item at each meeting, the length and burdens of the consenting process, with all projects expected to spend less than three years in the pre-application phase and 15 months in the examination phase in England and Wales.
16	The UK Government should implement key recommendations made in the Habitats and Wild Birds Directive Implementation Review. In particular, clarity should be provided, as quickly as possible, on the use of Imperative Reasons of Overriding Public Interest (IROPI) for offshore wind, and a new process for agreeing evidence requirements and significance thresholds up front should be developed with industry. The OWPB should monitor effectiveness, as mentioned above, by autumn 2012.
17	The industry urgently needs the Planning Inspectorate (PINS) to provide greater facilitation in the pre-application phase, including advice on the merits of issues, to ensure this stage is streamlined.
18	The UK Government should ensure that flexibility is maintained in the consenting process through (a) continued acceptance of the Rochdale Envelope approach and (b) provision for developers to be able to make reasonable, non-material amendments during the examination phase.
19	The DCLG should work with industry and PINS to produce guidance on what constitutes a material change, post consent, to ensure that non-material unforeseen amendments can be accommodated in a sensible and proportionate way, by the end of 2012.
20	The UK Government should ensure that Statutory Advisors are resourced sufficiently with appropriate and efficient task prioritisation to fulfil their roles in a timely manner, with a clear remit to deliver climate change mitigation and sustainable development alongside local nature conservation. In the short term (summer 2012), the industry and Government should focus on a solution for the Joint Nature Conservation Committee's (JNCC) resource shortfall.

Grid and Transmission Recommendations	
21	Government should engage with existing and new cable suppliers to identify possible measures to bring forward higher voltage HVDC polymeric cables. This would facilitate lower cost 1GW and 2GW HVDC connections
22	The industry should explore how to produce industry-wide project performance reports, potentially through the Offshore Renewable Energy Catapult Centre.
23	The Standardising body (discussed in the innovation chapter and possibly led by the Offshore Renewable Energy Catapult Centre) should review the potential for standardisation of transmission and substation modules. This group should have support from a technical group of experts with experience on standardisation matters such as the International Council on Large Electrical Systems (CIGRE)
24	RenewableUK's Offshore Grid Group to produce a paper by the end of 2012 on the potential role that a Design Authority could play in authorising the design of certain elements of offshore transmission and thus help promote standardisation and project de-risking. This would report to the OWDF to consider for potential further actions and would need to recognise the existing network planning role being carried out by National Grid as NETSO and the current ITPR review being undertaken by Ofgem
Finance Recommendations	
25	The industry should work to develop simpler innovative deal structures, especially during construction, which align stakeholders, including the Credit Rating Agencies, and deliver reliable long-term index-linked income streams. This is a complex task. We recommend the OWDF commissions a detailed investigation into how sufficiently transforming changes can be delivered quickly, drawing in financial and contracting expertise as necessary, by the end of 2012.
26	The Government (BIS) should deploy the Green Investment Bank (GIB) in the offshore wind sector as early as possible, which will facilitate and leverage the entry of new capital.
27	The industry and the GIB should investigate the development of vehicles for pooling wind assets, potentially on- and offshore, to provide risk diversity and facilitate the recycling of utility capital. DECC should take this forward, engaging The Crown Estate, OWPB and others.
28	The industry should engage the insurance sector to explore ways that their experience and product range can be used to help mitigate risks during construction and operation. The OWPB should initiate this.
29	The industry should encourage the entry of long-term risk capital into offshore wind, using the OWPB to lead the education and briefing of the finance sector. The OWPB should initiate this.

Chapter 1:
Supply Chain

Summary

The Offshore Wind Cost Reduction Task Force (CRTF) considers that increased competition and capacity are essential to securing reductions in cost from the supply chain, and that currently there are a number of potential bottlenecks within the supply chain that could delay delivery of projects, and increase risk and cost.

While there are significant investment opportunities for the supply chain, some activities are unlikely to mobilise quickly enough solely in response to market forces. Action should be taken now to mitigate these potential bottleneck impacts.

The UK has done well to attract commitments from turbine manufacturers to build capacity here. We must ensure those plans are followed through, and that the component supply chain exists to service these manufacturers. In addition, we have identified that, in the first instance, High-Voltage Direct Current (HVDC) cabling and equipment, foundations, and large component castings and forgings require specific attention to ensure that there is sufficient capacity to serve the UK, whether sourced from the UK or overseas. The supply of other components is at risk of becoming constrained, and Government and industry should work together to maintain diligence in identifying such risks and taking corrective action as early as possible.

The development of robust and effective strategies for encouraging investment and additional capacity must be a priority. There is no easy answer as to how best to achieve this. However, the CRTF notes that solutions require effective deployment of sufficient resources to identify and engender potential supply chain investors. The Scottish Government has retained its main development agencies, which are highly focused on delivering a successful offshore wind sector, while other parts of the UK have taken different approaches. We recommend that Government, across the UK, make it a priority to ensure that available resources are deployed urgently and effectively as a priority to secure greater supply chain capacity.

Visibility of the market is key. There is a need to create stronger relationships between the supply chain and developers, with better understanding of each others' needs and clearer visibility of wind farm project timelines, in order to give the supply chain confidence to invest sufficiently in capacity to meet demand.

UK offshore wind developers operate in global, albeit European-dominated, supply chain markets, and potential bottlenecks need to be assessed at this scale. While the CRTF focused on achieving cost reduction, we recognise that there may be good opportunities for UK companies to develop an area of competitiveness, with the potential to serve both UK and export markets. Developing additional manufacturing capacity that increases competition will support cost reduction through downward pressure on pricing and via the benefits of scale, learning and innovation.

Task Force Key Recommendations

1. The OWPB should lead the establishment of a strategic supply chain risk register by autumn 2012, to map key supply chain bottlenecks.

2. The Government needs to urgently increase its direct engagement with companies that have the capability of entering the offshore wind supply chain, to reduce potential bottlenecks. Engagement should be dedicated and focused. Working with industry, it should identify barriers preventing investment, such as access to finance, and examine what can be done to help individual companies enter the market.

3. RenewableUK/developers, through the OWPB, should build on the existing development of an online project timeline chart to provide better and more detailed project visibility. Developers, through the OWPB, should develop an engagement strategy for communicating opportunities to the lower tiers of the supply chain, using best practice identified from other sectors. This should be completed by the end of 2012.

4. The Government should put in place a mechanism to target and support Small and Medium-sized Enterprises (SMEs) to diversify, and provide advice towards the tender prequalification stages.

5. The Government should seek to secure the investment of as many turbine manufacturers as possible, to meet early Round Three timelines, using the tools that it has available. Support should be made available to help companies manufacturing key Tier 1 or 2 supply chain components.

Supply Chain Prerequisites

Offshore wind has a sizable and complex supply chain. Developers and their Tier 1 suppliers will not be able to deliver cost reduction without strengthening the deeper tiers of the supply chain. All businesses in the chain need to play a part.

In order for this to happen, a number of prerequisites are needed. Most importantly, a stable policy framework will give suppliers the confidence to invest. But a number of other factors are also important, including the location of the large Original Equipment Manufacturers (OEMs) and the Tier 1s, a robust and visible project pipeline, and a market of sufficient size. If these prerequisites are all in place, they can support competition and innovation in the supply chain to drive competitiveness and reduce costs.

Evidence from The Crown Estate

The Crown Estate's Offshore Wind Cost Reduction Pathways Study (TCE Study) shows that there could be a potential reduction in levelised costs of up to 16% by Financial Investment Decision (FID) in 2020 (based on the cost baseline of 2011), through interventions in the supply chain, mainly through increased competition, increased capacity and greater collaboration across the sector (further gains can be achieved through changes in forms of contracting and risk – considered by the CRTF in Chapter 3 of this report):

- **Competition** – there are currently few competitors in some parts of the offshore wind supply chain, and this has led to supply chain constraints and higher prices. There are now a large number of players at various stages coming into the offshore wind market, which will markedly change the supply picture in future years. This could lead to more competitive pricing, greater levels of innovation in product and service provision, rationalisation of procurement, and greater availability (or reduced risk of bottlenecks). In addition, a step change in cost reduction may occur in some components due to competition from low-cost countries.

- **Economies of Scale** – the TCE Study found that significant cost savings related to economies of scale are possible – for example increased productivity through greater volumes, standardisation, improved facilities, "learning by doing" and sweating assets. This driver is particularly relevant to the support structures and installation.

- **Vertical Collaboration** – currently, there are few examples of vertical collaboration in offshore wind. Yet, increased collaboration can reduce costs through optimising the design process and allowing the supply chain to plan more adequately. Active supply chain interface management, aligned to clear project goals, will support a reduction in contract contingencies and cost overruns.

- **Horizontal Collaboration** – there are potentially significant savings to be achieved through better collaboration on topics such as standard design, installation practices and servicing, and which would also further benefit training and Health & Safety. However, it is noted that, at present, collaboration of this nature has traditionally been constrained in offshore wind, mainly due to issues around intellectual property.

A number of prerequisites to deliver the cost savings identified in the TCE Study are identified – some of these are addressed in other chapters of this report:

(i) increased market certainty and volume visibility;
(ii) facilitating access to prototype testing sites, through an efficient planning process (see more detail in the Innovation chapter);
(iii) educating the finance and insurance communities (see more detail in the Finance chapter);
(iv) de-risking the pre-consent stage (see more detail in the Planning and Consenting chapter); and
(v) developing common standards (see more detail in the Innovation chapter).

Overall, the areas with the greatest potential for cost savings contributing to this total are identified as: installation, support structures and turbines. Therefore, these are suggested as priority areas to consider targeting for intervention. The cost of Operations and Maintenance (O&M) could realise further cost savings but this reduction is unlikely to be realised until post 2020. Therefore the CRTF recommends the OWPB consider examining O&M models from other sectors as part of its ongoing work, with the Oil & Gas sector an example of best practice.

Although the TCE Study analysis expects sufficient manufacturing capacity will exist to deliver current projects through to 2014, the expected ramp-up as Round Three deploys throughout the decade will need a significant increase in capacity. This should lead to increases in volume manufacturing and provides opportunities for cost reduction via scale, but further action to ensure supply can meet demand will clearly be required.

Evidence from the CRTF

The CRTF agrees with the main supply chain cost drivers identified in the TCE Study (which are addressed here and throughout this report), and we have added our own perspective of other factors impacting on the supply chain.

We recognise that scale is one of the factors to achieving cost reduction (and supply chain growth) and that the current ambition of 18GW (as detailed in the UK Renewable Energy Roadmap) provides a large enough market to attract turbine

manufacturers to the UK, each with a prediction of a reasonable market share. This is in the wider European context, which provides a potential export market and reduces market risk.

The work by both the UK and Scottish governments to strengthen port and manufacturing facilities and supply chain provision for offshore wind turbines and related components is welcome, and this should support cost reduction. However, markets and business plans are under constant change, and we urge both governments to continue to ensure that sufficient actions are taken to deliver these facilities.

The CRTF recommends that there are four immediate impacts on cost that need to be addressed:

1. Identifying and targeting key supply chain bottlenecks
2. Greater visibility of projects to support competition
3. Collaborating or cooperating to reduce costs
4. Targeted advice and support to SMEs

1. Identifying and Targeting Key Supply Chain Bottlenecks

A small number of key bottlenecks were identified as having the potential to delay the delivery of project schedules, thereby increasing costs through constrained supply and impacting on confidence. This was based on both our own discussions and evidence from The Crown Estate's study *Towards Round 3: Progress in Building the Offshore Wind Supply Chain*,[9] published in 2009 and updated in 2011. These were HVDC cables, Direct Current (DC) electrical equipment, castings and forgings, and foundations. The Crown Estate intends to update this study later in 2012. RenewableUK is examining opportunities for the UK supply chain to develop capacity, and its report will be published later in 2012.

If the supply chain is to be unlocked, the bottlenecks identified above need to be removed. Both industry and the Government have important roles. By encouraging a competitive local supply chain and providing it with clear project visibility well in advance of placing orders, the industry will do much to alleviate the bottlenecks themselves. The Government needs to rapidly build its sectoral knowledge of the supply chain, and therefore we recommend it has much more direct engagement with companies that have the capability of entering the market. Engagement should be dedicated and focused. Government and industry should be identifying the barriers preventing investment, such as access to finance, and long product test and evaluation times, and examining what can be done to help individual companies enter the market.

The CRTF recommends that industry should establish a strategic supply chain risk register by autumn 2012 to map key supply chain bottlenecks, to be owned by the OWPB, and which would take input on an ongoing basis from both these studies and their successors. Alongside this, the Government needs to urgently increase its engagement with companies, in the UK and overseas, that have the capability of entering the offshore wind market and alleviating potential bottlenecks.

2. Greater Visibility of Projects to Support Competition

Lack of capacity will lead to resource competition and increased costs. An important way of getting competition into the market is by having better visibility of projects (increased competition in the turbine market is already materialising, thereby providing evidence that if the market is created, supply will follow).

Discussions on project timelines are taking place between developers and OEMs or Tier 1 suppliers. However, evidence suggests this is not happening sufficiently beyond these prime contractors, and where it is happening, not in enough detail. RenewableUK is developing a document to map project timelines, which is welcome, but our evidence suggests industry needs to improve communications, either directly or through an aggregating body such as RenewableUK to provide more detail. We recognise that this can be challenging for industry as there are issues that can be sensitive, for instance giving competing developers information on project progress, especially if supply chain constraints are too severe. In addition, communicating effectively enough to give the supply chain sufficient confidence to invest itself takes time and resources. However, such actions do need to be addressed if the supply chain is to improve within tolerable timescales. In order to build on the work already done, an online project timeline chart to provide sufficient visibility of projects should be developed. Developers could also engage the Tier 2 suppliers directly by examining best practice in other sectors – for example, the Sharefair event used by the Oil & Gas sector, which provides a forum to hear about the latest development opportunities from the major players.

The CRTF recommends that RenewableUK/developers (and other stakeholders as necessary), through the OWPB, build on the existing online project timeline chart and develop an engagement strategy to communicate more directly with the

9. BVG Associates for The Crown Estate (February 2011), Towards Round 3: Progress in Building the Offshore Wind Supply Chain, http://www.thecrownestate.co.uk/media/275201/towards_round_3_progress_in_building_offshore_wind_supply_chain.pdf

lower tiers of the supply chain, and provide visibility of all offshore wind developments, and should examine best practice from other sectors to achieve this.

3. Collaborating or Cooperating to Reduce Costs

Collaboration can be either vertical or horizontal across the supply chain.

Vertical collaboration, particularly in the Front-End Engineering Design (FEED) stage of project development, brings the supply chain into the project design stage much earlier. This has been identified in the TCE Study as potentially having a significant downward pressure on cost.

Horizontal collaboration includes the development of common standards across technical and non-technical areas. These are covered in more detail in the Contracting Strategies and Innovation chapters respectively. The work of The Carbon Trust's Offshore Wind Accelerator is a good example of horizontal collaboration that can deliver benefits across the industry. Much work has been done by certification bodies such as the International Electro-technical Commission (IEC) to prepare international standards for offshore wind turbines, and these are under continuous review. In addition to standards, other guidelines have been published by other certification bodies, for example, DNV (2010)[10] and GL Renewables Certification (2007).[11] The CRTF recognises the importance of standards and guidelines and their role in drawing together a huge amount of experience and knowledge, and we strongly support their further development (technical and non-technical) in conjunction with all members of the industry (recommendations on standardisation are detailed in Chapter 2 – Innovation).

4. Targeted Advice and Support to SMEs

More needs to be done to help companies that have the capability to diversify into the sector. Smaller companies in particular need expert assistance in order to be competitive in a new market. New entrants to the supply chain need a single source of practical, well-informed and realistic advice. This becomes increasingly important further down the supply chain, where offshore wind becomes less central to the business of companies, and where companies do not have sufficient staff dedicated to identifying new opportunities, and understanding the industry and policy landscape. The CRTF recommends that, as part of working closely with industry to target key bottlenecks, Government should put in place a process/mechanism to target and support SMEs to diversify, and provide advice to support UK supply chain companies towards the tender pre-qualification stages.

Case Study:
Scottish Enterprise Supply Chain Development

The Scottish Government, through its Economic Development Agencies (EDAs), Scottish Enterprise, and Highlands and Islands Enterprise, undertook a number of integrated initiatives, along with its partners in the public and private sectors, to establish the offshore wind industry in Scotland.

This process has involved attracting and developing the necessary supply chain in Scotland, developing supporting infrastructure, and fostering the innovation as required by industry to lower the cost of energy. This coordinated approach covered:

Supply Chain – a focus on crucial components and services in the supply chain alongside continuous engagement with industry to understand its requirements. The EDAs supported this work by maintaining a level of targeted investment and support in crucial areas such as:

- support for prototype testing (£35m POWERS Fund);
- tailored support for key supply chain shortages;
- offshore wind expert support to help companies diversify;
- a supplier directory; and
- knowledge and supplier events.

Infrastructure – identifying the requirement for specialist facilities for the testing, manufacturing and deployment of offshore wind turbines.

Innovation – research to identify a number of areas for cost savings in the offshore wind sector; this includes detailed analysis of where alternative sectors, such as Oil & Gas can transfer skills to reduce costs, or specific areas of R&D that can deliver cost savings.

The Scottish Government recommended that their experience showed that a joined-up approach between Government and industry to identify barriers and propose actions and solutions could support and unlock supply chain growth and reductions in costs.

10. http://exchange.dnv.com/publishing/codes/toc_edition.asp?edition=2010-10

11. http://www.gl-group.com/en/certification/renewables/CertificationGuidelines.php

Conclusions

A strong supply chain is essential for cost reduction in the offshore wind industry, and the potential to industrialise the supply chain as we move into Round Three offers good potential for bearing down on costs.

However, the supply chain is still relatively immature, particularly in the UK, and Government and industry need to work together to support its growth. This will not be easy, and the Government urgently needs to increase its direct engagement with companies that have the capacity to enter the market. A supply chain risk register, backed and monitored by industry and Government, would support a more strategic direction for the supply chain, enabling key issues and bottlenecks to be identified and addressed. Market certainty is key to encouraging development of the supply chain, and Government needs to ensure it provides the right market and regulatory framework. At the same time, industry should learn from other sectors and ensure there is clear visibility of sufficient project development information to assist supply chain confidence and decision-making. Standardisation and greater vertical and horizontal collaboration can assist in removing new entrant market barriers. With the right interventions and strategic direction, the supply chain can play its part in reducing costs, while at the same time creating many thousands of jobs in the UK.

Chapter 2: **Innovation**

Summary

The Offshore Wind Cost Reduction Task Force (CRTF) considers innovation to be crucial to delivering cost reductions in offshore wind. Evidence shows that there are already significant amounts of innovation in train in offshore wind, addressing many of the key immediate innovation needs identified in this chapter.

Public sector support for innovation is coordinated through the Low Carbon Innovation Co-ordination Group (LCICG – Appendix 2). The CRTF welcomes this coordination and encourages the LCICG to work collaboratively with industry to ensure that innovation activities have the right focus and provide sufficient acceleration to deliver the cost savings in time.

The CRTF believes that it is a high priority that more work is done to bring forward a sufficient number of test and demonstration facilities (test sites), as this is particularly important for the success of Round Three. The next generation of offshore wind turbines must be more reliable, maintainable and structurally efficient than the current generation if the cost of energy is to come down. We are starting to see evidence of the design changes needed to achieve this, but all new products must be fully tested and proven before commercial-scale deployment can take place with the confidence of the financial community. The industry also needs to increasingly develop and adopt new foundations and installation methods.

An increased capacity to test new designs would support access to finance for new, lower-cost technologies and make the market more open to new entrants, potentially increasing competition. We recognise that there are test site developments already underway, but believe that all other potential avenues should be explored to deliver additional testing sites for early Round Three demonstration purposes.

Finally, as new technologies qualify for use in commercial projects, we need to balance the benefits of introducing new technology with the need to simultaneously put in place a process to introduce greater standardisation, to access benefits in the supply chain.

Task Force Key Recommendations

1. A Standardisation Body, operating at a technical level through the OWPB, needs to be created to examine and recommend areas for standardisation across all aspects of wind farm development and deployment. The OWPB should explore, with the Offshore Renewable Energy Catapult Centre, how this work would be undertaken, by autumn 2012.

2. Future onshore and offshore test sites, including testing on commercial projects, need to be delivered expediently and efficiently. Initially, RenewableUK/The Crown Estate should deliver a best-practice workshop to capture and build on lessons learned of current processes (and projects) for leasing and consenting of test sites, and should produce recommendations and actions for the OWPB to act on, with industry and Government, by the end of 2012.

3. Based on The Crown Estate's gap analysis of the availability and determined need of onshore and offshore test sites to meet initial early timelines for Round Three deployment, the OWPB should, by end of 2012, identify options and provide recommendations on how additional testing capacity can be quickly delivered.

Evidence from The Crown Estate

The CRTF has considered evidence from both The Crown Estate's Offshore Wind Cost Reduction Pathways Study (TCE Study) and the LCICG's Offshore Wind Technology Innovation Needs Assessment (OSW-TINA), which consider the potential for technology innovation to reduce the cost of offshore wind. Both studies conclude that provided all enabling actions are taken, innovation-driven cost reductions of up to 25% may be possible by 2020. This is driven mainly by higher energy yields and lower operating costs, which outweigh any potential slight increase in capital expenditure as larger, more reliable turbines are adopted.

The TCE Study determines that there are innovation opportunities across the entire value chain, from turbines through to installation and commissioning. Key innovations for cost reduction are identified as:

1. larger turbines, with higher power ratings, larger rotors, better aerodynamics and more reliable drivetrains;
2. new foundations, especially jackets, designed for serial manufacturing;
3. more capable bespoke installation vessels for foundation installation;

4. optimisation of array layouts; and
5. greater engagement with the supply chain during FEED studies.

The introduction of newer, larger turbines is the key area where innovation will drive down the levelised cost of energy, and there are a number of turbine manufacturers with larger turbines in development. However, a significant risk is the lack of availability of suitable test sites and major component test facilities. Such facilities would provide developers and financiers with more confidence that turbines can be deployed at a commercial scale. They would also provide better learning and confidence in the testing and demonstration of support structures and installation methods.

The TCE Study analysis also highlights that flexibility in the planning process, to allow developers to delay finalising technology choices until after consent, is important in allowing more innovative technologies to be adopted, and that earlier collaboration between industry partners (as outlined in Chapter 3) would also allow greater optimisation during the design (FEED) phase of projects.

Evidence from the LCICG's OSW-TINA

In February 2012, the LCICG published a technology analysis of offshore wind that identifies the key innovation requirements and the case for public-sector investment to support the innovation required to make the technology cost competitive. This analysis identifies potential savings of up to 25% by 2020, which is broadly in line with the TCE Study.

The OSW-TINA analysis identifies four key priorities for future UK public-sector support to help realise these benefits:

1. turbine test sites, drivetrain and blade testing facilities;
2. innovative designs of high-yield, high-reliability turbines, foundations for depths greater than 30m, cabling concepts and installation techniques;
3. serial manufacturing of foundations; and
4. measurement and sharing of data.

The outputs from the OSW-TINA analysis have informed decisions on the focus and design of recent LCICG members' innovation support activities ¬– including the decision to create the Offshore Renewable Energy Catapult Centre and the Department of Energy and Climate Change (DECC)/Technology Strategy Board Offshore Wind Component Innovation Scheme. In addition, the OSW-TINA analysis is informing the LCICG's development of a medium-term (3-year) plan and a longer-term (5–8-year) strategy for public-sector low-carbon innovation support.

Case Study:
The Carbon Trust's Submission to the CRTF

The Carbon Trust presented analysis to the CRTF on how innovation could be built into commercial models, which had the potential to reward early demonstration of new technologies within commercial projects in order to compensate for the additional risks and costs incurred. This analysis was debated by the CRTF and will be considered further as part of Recommendation Three on testing facilities. Potential mechanisms suggested by The Carbon Trust include:

(i) **Public incentives linked to innovation** – In the Netherlands, the project developer Eneco received a government grant conditional on including innovation within a commercial project. This has incentivised Eneco to include new turbines and foundations in the project. This type of approach could be either grant- or Renewables Obligation Certificate-based, conditional on developers delivering a minimum threshold of innovation. This could be funded through existing innovation programmes, potentially with additional EU funding.

(ii) **Regulation** – In future, The Crown Estate could consider including an innovation requirement in the terms of its leases, for example, a minimum number of innovative turbines in the first phase of development.

(iii) **Industry collaboration** – Joint ventures between developers with significant interests in Round Three would not only allow risks and costs to be shared, but also the sharing of findings and reaching consensus on optimal technology choices. Joint ventures could range from collaborations to test a new foundation on an existing wind farm, to developing a small wind farm with novel technologies.

Tactical opportunities may also exist to improve the feasibility of demonstration projects. For example, the economics of the Beatrice demonstrator were strengthened by linking it to an Oil & Gas project. This type of initiative may also have beneficial effects for consenting.

Evidence from the CRTF

Having considered the TCE Study, the OSW-TINA study and The Carbon Trust analysis, each of which has involved consultation with industry and research organisations, the CRTF has identified a number of actions to deliver cost reduction towards the £100/MWh target through innovation. The key actions are:

1. Availability of Test Sites

The CRTF recognises the developments already underway, including NaREC (which includes an offshore test site, blade test facilities and a drivetrain test facility currently under construction),[12] which has been supported with funding from the UK Government, and the European Offshore Wind Deployment Centre (EOWDC),[13] and notes that it is important that these facilities are delivered as quickly as possible (recognising they are both currently in the consenting process). However, these sites may not be operational in time to meet early Round Three deployment timescales. We consider it important therefore that, building on the current data available on demand for test sites, all other potential avenues should be explored to deliver additional onshore and offshore sites to demonstrate early Round Three technologies. With timely access to test sites, the industry will increasingly be able to adopt new turbines, foundations and installation methods in commercial projects, which will reduce costs. This would also make new, lower-cost technologies more readily acceptable to the finance community. The market would also be more open to new entrants, potentially increasing competition.

There is a clear need to ensure that test sites for the new generation of turbines and support structures are brought forward in a timely manner. One option is to promote the development of testing on commercial projects, which has the added benefit of securing R&D activity in the UK. Chapter 4 considers how flexibility in the planning system can enable this to occur.

In addition, the CRTF concludes there is an immediate need to address the issues raised in The Crown Estate's gap analysis of test and demonstration sites,[14] which identifies that there will be a shortage of onshore and offshore test sites to meet the demand from turbine manufacturers. Building on that report, a comprehensive analysis of onshore and offshore site availability and timelines for testing turbines for early Round Three deployment is needed. The analysis should also consider the full range of options for funding and delivery, including identifying commercial projects and associated funding models that could potentially host demonstration technology. It should also be used as a reference point to monitor progress in developing capacity.

Complementing that analysis, it is imperative that lessons are learned from the experience of existing sites and sites under development, including in Europe, to identify issues and prioritise actions to ensure that future projects are delivered as efficiently as possible. Therefore, the CRTF recommends that RenewableUK and The Crown Estate deliver a best-practice workshop to learn lessons from the consenting of existing and planned test site developments in the UK (and possibly overseas), and recommend actions for the OWPB to consider.

2. Continued Government Support for OSW-TINA Priorities, Coordinated through the LCICG

The LCICG, whose core membership comprises the Department for Business, Innovation and Skills (BIS), DECC, the devolved administrations, The Carbon Trust, the Engineering and Physical Sciences Research Council, the Energy Technologies Institute and the Technology Strategy Board, seeks to take a strategic approach to the delivery of low-carbon innovation, both in the short and long term. The CRTF welcomes the work of this group to ensure that UK public-sector R&D initiatives are coordinated to avoid duplication, and are aligned with industry needs and capabilities. We believe it is important that the LCICG and industry work more closely together to ensure that the priority innovation needs continue to be addressed effectively.

The CRTF notes that there are a number of other potential areas for innovation that should be considered by the appropriate bodies, mainly around O&M (advanced condition monitoring, novel O&M strategies), installation and logistics, and wake (airflow) management. As part of its ongoing work, the LCICG should consider how these are best addressed, potentially through industry/Government collaborations, linked to test and demonstration facilities.

Building on this, the CRTF sees a number of innovation-led opportunities that could deliver significant benefits by 2020. However, delivery will require collaboration across the industry, through the supply chain, and with Government and regulators. In particular:

12. http://www.narec.co.uk/testing_development/

13. http://www.vattenfall.co.uk/en/aberdeen-bay.htm

14. Garrad Hassan for The Crown Estate (August 2011), Gap Analysis of Test and Demonstration Facilities for Offshore Wind Technologies, http://www.thecrownestate.co.uk/energy/case-studies/demo-sites/

(a) Collaboration through the supply chain, to deliver more cost-optimised integrated design approaches to the turbine system (turbine, tower, foundation, electrics). Currently, individual companies typically do not have the breadth of design responsibility to deliver these benefits (unless they are in an Alliance) and so collaboration between industry players, for example through The Carbon Trust's Offshore Wind Accelerator (OWA) or the work of the new Offshore Renewable Energy Catapult Centre, should be promoted to maximise learning and to reach consensus on technology choices.

(b) Sharing best practice (e.g., for cable installation), data and standards between equipment developers and those deploying technologies would accelerate the adoption of innovations in the market.

(c) Collaboration between industry, Government and regulators, to target rapid change to regulation that prevents the introduction of new, lower-cost technical approaches (e.g., moving grid compliance requirements from each turbine to a central array requirement).

Continued focus on efficiency will be required. While the scope of the CRTF is to consider cost reductions to 2020, we should not ignore the need for continued innovation to deliver yet more efficient turbines beyond this date (we note the recent announcements from the Energy Technologies Institute on floating platforms as an example of innovations targeted at deployment post 2020). Indeed, Round Three will not have delivered its full capacity of 32GW by then. Government and industry should continue to support innovation throughout this decade. The LCICG should have a key role in facilitating this longer-term focus and investment in close cooperation and engagement with industry.

3. Standardisation

Standardisation of key components has the potential to reduce costs and can also help to foster innovation.

Innovation, however, is not limited to new technology – it can also improve processes. One example specifically discussed by the CRTF is cable installation. A lack of firm guidelines or standards, and inappropriate processes, were viewed to have resulted in costs being higher than they otherwise could have been. To drive a standardisation programme we recommend that a Standardisation Body is established and that the OWPB, with the support of the LCICG, should explore with the recently established Offshore Renewable Energy Catapult Centre if the latter could be the appropriate body to take this forward.[15] The Standardisation Body should be contractor-led, with an international focus, and should initially target a small number of key areas to drive standardisation, for example, standard HVDC voltages. The Standardisation Body should not limit itself to technical standards, but consider process and competencies, for example, cable lay installation.

Offshore Renewable Energy Catapult Centre

The Offshore Renewable Energy Catapult is one of a series of Catapult Centres being established in technology sectors of strategic importance to the UK. The ORE Catapult will help UK business to research, test and measure the application of new technologies and materials, building on the strong track record of innovation in offshore renewable energy undertaken in the UK over many years.

Following an open competition, the Technology Strategy Board selected a single consortium bid from the Carbon Trust, the National Renewable Energy Centre (NaREC) and Ocean Energy Innovation to set up the Catapult. In February 2012, the Technology Strategy Board announced that the Catapult would have its primary location in Glasgow, Scotland, with a second site in the north-east of England (Northumberland). It is expected to open for business in the summer of 2012.

The Catapult will receive up to £10m a year over five years from the Technology Strategy Board. Its focus will be on technologies applicable to offshore wind, and tidal and wave power.

The UK has world-leading expertise in offshore engineering and understanding of the seabed and marine environment. It has given us a worldwide reputation in offshore facilities and makes the UK an excellent base for offshore research and development.

The Catapult will work with the world-class UK research and innovation community in offshore wind, tidal and wave, and the growing UK offshore renewable energy industry, and will build strong links to centres of excellence, such as the European Marine Energy Centre (EMEC), Wave Hub and the recently announced marine energy park in the south-west of England.

15. https://connect.innovateuk.org/web/offshore-renewable-energy-catapult

It will establish the strong international links required to facilitate the commercialisation of new technologies and will also forge long-term relationships with the European Commission through active involvement in both its current and future framework programmes.

A delivery plan for the Offshore Renewable Energy Catapult will be developed over the next few months, with the aim of opening the centre in summer 2012.

Conclusions

Clearly, the industry will have to innovate to meet our cost reduction targets. The CRTF was encouraged by the amount of innovation work going on, but recognises the apparent gap in sites to test new turbines, foundations and installation designs and processes. Consideration as to where, and who, can deliver early Round Three demonstration facilities should be an urgent priority, as well as learning the lessons on current projects to ensure timely delivery of additional facilities in the future.

The CRTF recognises that the Government, through the LCICG, is taking a strategic view of innovation delivery, and working with industry to improve turbine design and reliability, which will deliver cost reductions by 2020. The LCICG and industry must look for ways to strengthen their links to ensure activities are well aligned. There is also a need to consider how to fund the delivery of the next generation of post-2020 turbine technology. Standardisation in the offshore sector could also deliver benefits and the Offshore Renewable Energy Catapult Centre could potentially help address that need.

Chapter 3:
Contracting Strategies

Summary

The Offshore Wind Cost Reduction Task Force (CRTF) has taken evidence from industries inside and outside of the electricity sector, which have comparable characteristics and which have reacted to an urgent need to reduce cost. Those examples have shown that adopting an Alliancing approach (see Appendix 3: Alliancing Principles) to contracting strategies can lead to significant cost reductions as well as improving delivery timescales, securing capacity in tight markets, and enhancing Health & Safety performance.

Evidence over the last decade of the delivery performance of offshore wind projects where costs have often risen and suppliers have encountered major financial difficulties suggests that, compared to other sectors where Alliancing is applied, current prevalent contracting approaches are not optimised in terms of risk allocation and mitigation, interface management and value optimisation. We therefore recommend that there is scope for the offshore wind sector to seek to adopt a different approach to contracting.

We recognise that Alliancing models have many variations, ranging from informal working relationships between developers and the supply chain to full blown partnerships. We also recognise that there are barriers currently present that limit the scope today of realising the full extent of benefits enjoyed by other sectors. We therefore recommend that where possible industry works to reduce those barriers. In particular, there is scope for a Common Knowledge Forum for practitioners to share experiences, both within and outside the offshore wind sector. The sector could also build on O&G sector experience and hold a regular forum of senior managers to continually review prospects for a more cooperative approach across the sector, to create the potential for standardised contracting approaches and/or pre-qualification requirements.

Actions are also required (referred to elsewhere in this report) to ensure new turbines are type tested more quickly to allow developers and turbine suppliers to create stronger alliances and better value earlier.

Task Force Key Recommendations

1. Evidence suggests strongly that Alliancing approaches have driven down costs in other sectors. Developers should seek to adopt these approaches and we suggest the OWDF initiates an action plan with senior management across the industry by autumn 2012.

2. A Common Knowledge Forum of senior industry practitioners should be established by the end of 2012 to identify best practice and models to help companies seeking to adopt new contracting strategies.

3. The Common Knowledge Forum should seek to standardise processes, technology and contracts where appropriate, to facilitate companies adopting this model.

4. The Common Knowledge Forum would continually seek to identify and address barriers that prevent offshore wind going further along an Alliancing model.

Evidence from The Crown Estate

The Crown Estate's Offshore Wind Cost Reduction Pathways Study (TCE Study) provides evidence on the potential impact of adopting revised contracting approaches in offshore wind. Greater vertical cooperation within the supply chain is one of the largest potential areas of cost reduction and could reduce the levelised cost of energy by around 4% by 2020. The impact occurs across the supply chain, but is potentially most beneficial in respect of installation, support structures and turbine costs.

The methodology adopted in the TCE Study does not allow Alliancing to be measured as a distinct stand-alone feature in terms of the impact it could make on reducing costs. However, it is clear from the other areas of cost reduction measured in their report that adopting Alliancing behaviours and models can contribute strongly to such reductions, raising the impact well above 4%. These include visibility of the future order book, better allocation of risk, reduction in, and better management of, contingencies, better interface management and the cost benefits of continual improvements through long-term working relationships (part of economies of scale).

The CRTF therefore took evidence from a variety of other sources to strengthen the evidence and rationale for a wider adoption of this approach to delivering projects.

Evidence from Other Sectors

The CRTF considered evidence from a number of comparable sectors.

Oil & Gas Sector

In the late 1980s, the oil & gas sector (O&G) faced a challenging future with the dramatic fall in the oil price making many of the North Sea fields uncompetitive. The sector responded by launching Cost Reduction in the New Era (CRINE), which brought together oil companies, contractors and suppliers to try to reduce the capital cost of oil & gas projects by 30% and to halve operating costs in the UK Continental Shelf. The four main areas addressed were contracting relationships and risk allocation, standard contracting terms, forward planning and visibility of activity, and improving the efficiency of the prequalification and bidding processes.

Within the contracting relationships and risk allocation theme, the industry identified that the contracting approach at that time was adversarial, with duplication of effort, duplication of cost and underutilisation of expertise. There was therefore a move to more collaborative "Alliancing" relationships, with cost transparency, pragmatic risk allocations, shared contingencies and all parties rewarded on the basis of overall project outcomes.

A subsequent initiative, PILOT (formerly the Oil & Gas Industry Task Force)[16] established a Strategic Board, which met every month, with a sub-committee looking at contracting approaches. This had buy-in from senior management of the major players, leading in turn to buy-in from senior management throughout the supply chain. The forum has developed common contracting strategies (which is challenging and can take time to do) that minimise rewrites and enable quicker participation in projects.

These reforms resulted in a large number of projects being built using an Alliancing model and which were completed between 25–30% cheaper than the traditional norm. Projects delivered in this way include BP's Andrew and Clair, BOL's Britannia and Shell's Shearwater.

National Grid

In 2001–2, National Grid (NG) realised that their contracting arrangements were not working effectively, with a stagnant safety performance and an increasingly long supply chain. This led to bottlenecks and reduced the ability of NG to provide long-term commitments to suppliers.

As the first step to an Alliance, NG determined some key principles upon which any Alliance would be based. These included shared risk/reward and a focus on mutual goals.

NG then created four Alliances for transmission substation infrastructure, comprising three with existing substation suppliers (Siemens, ALSTOM and ABB) and a fourth with a potential new entrant (Mitsubishi) selected through a competitive process. The Alliances also included a civil construction partner and a designer.

These Alliances are benchmarked against each other, while innovation is shared across the Alliances. The result was a marked improvement in Health & Safety on construction projects and an increase in the volume of capital projects delivered. A cost ratchet mechanism led to reduced cost, while security of supply and resource availability also improved.

As a result, NG recently took the opportunity to renew these Alliances and, in addition, to drive more value out of the approach through:

- industry benchmarking, open book accounting and auditing with 10% cost reduction expected;
- greater competition across Alliances;
- design standardisation;
- joint purchasing; and
- the introduction of two new overhead line Alliances and a separate cable delivery initiative.

The CRTF also took evidence from Scottish Water, which has a successful partnering approach to its capital programme, albeit of more standardised components.

Evidence from the CRTF

Discussions within the CRTF and with stakeholders suggest that current offshore wind contracting strategies are not working effectively, with risk allocated in ways that can lead to contingencies, insurance and effort duplicated across the supply chain. Construction costs have in some cases escalated, with interfaces poorly managed and projects delivered behind schedule.

However, we are starting to see companies explore different contracting arrangements that are consistent with the more collaborative approach developed in the O&G and electricity sectors. For instance, DONG Energy has begun partnering with the supply chain through framework agreements, and SSE has formed formal working relationships pre-FID with turbine suppliers and service providers.

16. PILOT: http://www.decc.gov.uk/en/content/cms/meeting_energy/oil_gas/pilot/pilot.aspx

Case Study:
DONG Energy

In 2009, DONG Energy entered into a framework contract with Siemens, allowing for a higher degree of standardisation of deliverables and helping Siemens bring the new 120m-rotor 3.6MW turbine to market. The structures of the contract aimed at supporting the financial value drivers of an offshore wind project, as opposed to looking purely at capital expenditure (CAPEX). The first projects constructed under the framework contract were Walney I and Walney II – the latter being installed in 5–6 months.

DONG Energy and Siemens have also invested in other parts of the supply chain, including joint ownership of the installation vessel companies A2Sea and CT Offshore. DONG Energy also has framework contracts with Nexans (array cables) and Bladt (foundations).

There are some challenges in exploring more collaborative arrangements in offshore wind. To date, there are only a limited number of players who have the necessary experience, ability to perform and the financial robustness that are normally considered prerequisites for Alliancing. Partners need to be selected early in the design and/or construction phase of a project, and many of the potential partners' capabilities have yet to be established. Many turbine manufacturers are developing their next generation of turbines and as yet cannot verify machine reliability or price. This can make it difficult for them to join an Alliance if developers require greater certainty. The turbine manufacturers in turn may prefer today to compete in the open market. We would hope to see turbine manufacturers participate in Alliances as technology progresses.

Nevertheless, it would seem easier for other suitably qualified participants of the supply chain to join Alliances sooner.

In addition to choosing the right partners, developing an Alliance requires consideration of how best to bring competition into the agreement. Options include running competitive processes to identify partners; initial design of an Alliance and then tendering for delivery; or cross-Alliance competition and benchmarking. Alliancing is therefore consistent with competition and has been used in other sectors to bring in new entrants.

Importantly, more collaborative contracting arrangements also require a significant cultural change from traditional procurement approaches, with developers moving away from a purely competitive, potentially adversarial climate, to total integration and alignment around mutual goals. This approach may be particularly challenging for large utilities with central procurement departments. Alliancing requires cost transparency, pragmatic risk allocations and shared contingencies, which are quite radical concepts. Buy-in from top management and strong leadership is essential in driving an Alliancing approach forward.

In terms of timing, we recognise the industry is at a stage where many developments are significantly advanced along the design process, with 16GW of projects expected to submit planning applications in 2012-13. Substantial amounts of design work will already have been completed. Yet evidence from other sectors shows that the principles of collaborating with the supply chain can be applied at various stages of design and project execution. For example, Alliancing ahead of and during the construction phase can help pool contingencies, avoid duplication and jointly manage risk, including interface management and weather. We therefore suggest that there remains significant scope in the offshore wind sector to seek to adopt such principles now, and also that less well-developed projects clearly have greater scope to adopt full-blown Alliance models.

To help overcome some of these challenges, senior buy-in will be crucial, and the CRTF recommends that the OWDF should develop a strategy for taking Alliancing forward. This should include setting up a Common Knowledge Forum, where lessons can be learned from other sectors that have adopted an Alliance approach.

Case Study:
Application to Offshore Wind – SSE

SSE recently formed two Alliances. One, involving Siemens, Subsea 7, BiFab and Atkins, is developing the Beatrice offshore wind project. The other, with Mitsubishi, Technip and Wood Group, is focused on the development of Mitsubishi's new offshore wind turbine. Key factors behind the decision to adopt an Alliancing contract strategy were a realisation that a large proportion of a project's installation cost is spent on marine installation (22%) and that there was a need for the design and manufacturing of offshore wind farm components to be better suited to a marine environment than had been experienced historically. This led SSE to identify four key areas of competence to design and deliver an offshore wind farm project:

(i) Power Generation and Manufacture;
(ii) Major Capital Projects Management;
(iii) Offshore Construction; and
(iv) Marine Operations.

After discussions with suppliers, SSE did not feel that any one provider could offer all these different work elements to the level of competence required. At the same time, SSE realised that elements of the offshore wind supply chain are highly constrained and that partnering and cooperation with the market leaders would allow SSE to secure its needs. This desire to work with the supply chain, combined with some team members' experience from the Oil & Gas sector, led SSE to implement an Alliancing approach.

SSE has developed two slightly different Alliance structures, in part to help drive cross-Alliance competition. At this stage, SSE is the lead partner, to ensure it maintains ultimate control over the contracts and can drive through the cultural changes required in partner organisations. To ensure competitive pressure, SSE opened up its financial model to suppliers and set KPIs for suppliers to beat cost targets, with bonuses if they exceed expectations.

Although the Alliances are still at early stages, SSE is starting to see the benefits, with conversations happening at an early (pre-consent) stage that wouldn't otherwise occur until much later in a project's life cycle. For example, access to early load data for the Siemens 6MW machine is set to significantly reduce the cost of jacket foundations. The Alliance has helped identify and resolve potential consenting issues and has given SSE a much better idea of the knowledge required to construct wind farms in challenging deeper water with distances further from shore. The Operations & Management team is embedded within the project team, allowing the individuals who will operate the wind farm for the lifetime of the asset to be involved in early design decisions that can improve the operability of the project. However, the process has not been easy, with the overcoming of cultural differences being extremely challenging. Senior management buy-in has therefore been critical.

"Alliances stand and fall on the quality of the inter-company relationships, and achieving consensus is challenging, but for every negative of the Alliance there are six positives that outweigh it."

Andrew Donaldson, Offshore Engineering Manager, SSE

Conclusions

Alliancing has been successful in other industries with similar characteristics to offshore wind and which have faced a critical and urgent need to reduce costs or improve otherwise stagnant safety or delivery records. The offshore wind industry now faces similar challenges, with current traditional contracting approaches often failing to stem cost increases or deliver projects on time. The CRTF recognises that Alliancing in itself is not a long-term solution to ongoing cost efficiency – with experience, greater competition and innovation must prevail to maximise efficiency and lower costs. However, for the next few years a more radical approach to contracting, such as employed by the O&G sector, will go a long way to delivering significant cost reductions by 2020.

The CRTF recommends that a number of things can be done to make the adoption of Alliancing approaches easier, for example, by sharing lessons from both within and outside the electricity sector through a Common Knowledge Forum. The forum should continually review prospects for a more cooperative Alliancing approach across the sector and must have senior management buy-in to drive the cultural changes required.

Chapter 4:
Planning and Consenting

Summary

Confidence in the planning and consenting system is very important for the entire industry and fundamental for cost reduction. Delays and uncertainty increase cost, extend development timelines and impact investor confidence.

The Government has undertaken a range of actions, referenced in this chapter, to streamline the consenting process. The Offshore Wind Cost Reduction Task Force (CRTF) welcomes these initiatives.

However, consenting remains a major concern for the offshore wind industry.

We need to ensure that the changes proposed by Government are implemented, properly resourced and deliver real change on the ground. We need to improve the system by learning lessons, and there needs to be a stronger partnership across Government, industry and stakeholders to work more collaboratively together, proactively addressing issues before they become major barriers. The recommendations put forward in this report hope to achieve this.

The CRTF therefore urges the Government and devolved administrations to implement the recommendations below and to remain focused on ensuring that the planning and consenting systems across the UK deliver a smooth pipeline of projects in a timely and efficient fashion.

Task Force Key Recommendations

1. The Offshore Wind Programme Board (OWPB) to monitor, as a standing item at each meeting, implementation of changes to the consenting process, informed by industry review of their effectiveness.

2. The OWPB to monitor, as a standing item at each meeting, the length and burdens of the consenting process, with all projects expected to spend less than three years in the pre-application phase and 15 months in the examination phase in England and Wales.

3. The UK Government to implement key recommendations made in the Habitats and Wild Birds Directive Implementation Review. In particular, clarity should be provided, as quickly as possible, on the use of Imperative Reasons of Overriding Public Interest (IROPI)[17] for offshore wind, and a new process for agreeing evidence requirements and significance thresholds up front should be developed with industry. The OWPB should monitor effectiveness, as mentioned above, by autumn 2012.

4. The industry urgently needs the Planning Inspectorate (PINS)[18] to provide greater facilitation in the pre-application phase, including advice on the merits of issues, to ensure this stage is streamlined.

5. The UK Government should ensure that flexibility is maintained in the consenting process through (a) continued acceptance of the Rochdale Envelope approach and (b) provision for developers to be able to make reasonable, non-material amendments during the examination phase.

6. The DCLG should work with industry and PINS to produce guidance on what constitutes a material change, post consent, to ensure that non-material unforeseen amendments can be accommodated in a sensible and proportionate way, by the end of 2012.

7. The UK Government should ensure that Statutory Advisors are resourced sufficiently with appropriate and efficient task prioritisation to fulfil their roles in a timely manner, with a clear remit to deliver climate change mitigation and sustainable development alongside local nature conservation. In the short term (summer 2012), the industry and Government should focus on a solution for the Joint Nature Conservation Committee's (JNCC) resource shortfall.

Note: the Innovation chapter contains recommendations concerning the consenting of test sites.

Evidence from The Crown Estate

The Crown Estate's Offshore Wind Cost Reduction Pathways Study (TCE Study) highlights that a key prerequisite for cost reduction is for projects to emerge from the planning and consenting system in a reliable, predictable and timely fashion. Confidence and predictability in the planning and consenting

17. A project likely to affect the integrity of a European Protected Site may proceed only if there are no alternatives, if there are IROPI and satisfactory compensation measures.

18. The National Infrastructure Directorate replaced the Infrastructure Planning Commission. It is part of the Planning Inspectorate. In this chapter, we refer to the Planning Inspectorate.

process allow developers to make project commitment decisions earlier. This in turn transmits confidence to investors and the supply chain, hence encouraging greater collaboration, easing the entry of innovative new products, and shortening project timelines. This reinforces the importance of meeting the timetable for planning determination and of ensuring that the pre-application process works effectively.

The TCE Study also highlights that the next generation of turbines offers great potential for cost reduction, with other studies, notably The Crown Estate's 2011 Gap Analysis of Test and Demonstration Facilities for Offshore Wind Technologies, highlighting the need for availability of sites to test and demonstrate these turbines and other technologies, as well as the need for flexibility in the consenting process. Therefore, the process for consenting new test sites needs to be as simple and quick as possible. Similarly, the TCE Study also notes that ancillary consents for ports and waterside infrastructure are important in order to facilitate investment in the supply chain in the UK and to reduce costs.

Government Initiatives – England and Wales

The Government has undertaken a number of very useful steps to improve the process in England and Wales. In summary, these include:

- the formation of the National Infrastructure Directorate within the Planning Inspectorate (PINS) replacing the Infrastructure Planning Commission;
- the designation of the National Policy Statements for energy;
- the designation of the (more general) National Planning Policy Framework;
- the Review of the Implementation of the Habitats and Wild Birds Directive;
- the Localism Act 2011; and
- the Department for Communities and Local Government (DCLG) Light Touch Review of Planning Act guidance this year, with a fuller review of the Planning Act system announced for 2014 (i.e., once enough applications have been processed for there to be a real evidence base).

Light Touch Review: in response to feedback, the Department for Communities and Local Government launched a consultation on proposed changes to the suite of guidance documents that underpin the Planning Act 2008 in England and Wales.[19] The changes to these documents streamline the guidance, reduce bureaucracy and increase flexibility in the permit granting process, and are intended to make the regime clearer and easier to use. In addition, the IPC/PINS has issued guidance on the use of the "Rochdale Envelope" approach (which allows flexibility within an application),[20] and its decisions to date on accepting applications for examination have also been helpful in this respect.

On post-application flexibility, DCLG Minister Bob Neil MP has informed the IPC/PINS that, *"where a pressing need to amend an application arises post-submission it should be possible, provided those changes are not so substantial that they constitute a new application, to accommodate them"*.

Government Initiatives – Scotland

The Scottish Government (SG) is responsible for the consenting of renewable energy projects in both Scottish inshore waters and the Scottish part of the Renewable Energy Zone. In April 2011, SG initiated a one-stop-shop for offshore wind, wave and tidal developers to obtain consents and licences in Scottish waters. This creates a simpler, more streamlined process to handle marine/offshore development applications and aims to reduce some of the burden for applicants and regulators alike.

To build on existing initiatives, the Scottish Energy Minister Fergus Ewing MSP chaired a Short Life Task Force, charged with further streamlining the scoping, planning and consenting of offshore renewables. It suggests eight recommendations, which focus on improving Scotland's planning and consenting landscape by requiring wide-ranging early pre-application engagement, coordinating the collation of, and access to, relevant data, as well as funding regulators and Statutory Advisors sufficiently to deal with the peak of project applications expected in the near future. The report also recommends prioritising and accelerating work on the identification of potential sites for new test facilities.

SG requires developers to consult early with other industries and with communities, and to use common standards when surveying potential sites, while it requires public agencies to commit sufficient resources to be able to provide good information, timely advice and clear decisions to developers and other interested parties.

19. The consultation ran for 12 weeks from 13 April 2012. Further details are available at http://www.communities.gov.uk/planningandbuilding/publications/guidance/

20 The Planning Inspectorate (April 2012), Advice Note 9: Using the "Rochdale Envelope", http://infrastructure.planningportal.gov.uk/wp-content/uploads/2012/03/Advice-note-9.pdf

Government Initiatives – Northern Ireland

The first offshore renewable energy leasing round is currently underway in Northern Irish waters, and The Crown Estate expects to offer development rights for an area that could deliver up to 600MW by autumn 2012. As part of wider facilitative activity, Northern Ireland is taking forward work to build on and develop the existing offshore planning and consenting regime, learning from GB experiences to date, and will take this report's recommendation into account within the devolved position.

Evidence from the CRTF

The CRTF agrees with the TCE Study and considers that confidence in planning and consenting is fundamental for cost reduction. Increased certainty in the planning and consenting process offers the potential to reduce development timelines, during which time expensive (high-risk appetite) capital is deployed. The CRTF also notes that, in offshore wind, significantly larger sums of capital are invested at risk pre-FID than in onshore wind. Early delivery of projects is more likely if key procurement decisions are made prior to consent being received. These decisions require significant commitment from developers, who therefore require confidence in the planning and consenting process. If projects can reduce the length of time that they are exposed to expensive development-stage capital, this reduces the overall project cost of financing. The supply chain also has to have confidence in the planning and consenting timelines to allow new facilities to come on-stream at the appropriate time. Predictable consenting for related onshore grid infrastructure, such as overhead lines and substations, is also very important.

The final success rate of developers under the Electricity Act system (in England and Wales)[21] has been good – the vast majority of projects have gained consent, with almost all the remainder withdrawn by the developers, following consultation with stakeholders. However, this success has not translated into developer confidence, partly because average consenting times have increased from Round One to Round Two and partly because a limited number of high-profile cases have suffered long delays.[22] Planning and consenting is still perceived to be a major risk factor.

Many of the changes in England and Wales, and the recommendations in Scotland, are very recent and, as the first full applications under the new system have only been submitted recently, the benefits have not yet flowed through into increased confidence.

Bearing these recent changes in mind, the CRTF highlight the following priority issues:

1. The Need for Flexibility

The consenting process needs to be flexible enough to allow developers to optimise projects post consent, allowing them to take advantage of technical progress (e.g., increase in turbine sizes) and undertake competitive procurement exercises. Although PINS has indicated that it is willing to consider some flexibility, until a number of consenting decisions have been reached there remains some uncertainty over the size of the acceptable Rochdale Envelope. Unforeseen changes may also arise post-application or post consent, and the system needs to be able to accommodate such changes fairly, effectively and in a timely fashion. The CRTF therefore recommends that flexibility is maintained in the consenting process through (a) continued acceptance of the Rochdale Envelope approach and (b) provision for developers to be able to make reasonable, non-material amendments during the examination phase. In addition, DCLG should work with industry and PINS to produce guidance on what constitutes a material change – post consent – to ensure that non-material unforeseen amendments can be accommodated in a sensible and proportionate way.

2. Streamlining the Pre-application Process

The Planning Act marked a radical change in consenting in England and Wales, with the process "front-loaded" and greater requirements for formal consultation. This front-loading places the emphasis on the developer to resolve as many issues as possible before the application is submitted but, with the IPC previously unable to advise on the merits of applications and hence taking a hands-off role pre-application, developers struggled to strike the right balance between caution and speed. The Localism Act repealed the provision of the Planning Act that prohibited the IPC from advising on the merits of applications before they had been submitted for examination.[23] This change should address a concern raised by developers, and allow a more effective pre-application process. Of course, it will be important to ensure that this delivers benefits in practice. The CRTF therefore highlights the importance of PINS going as far

21. Section 36 of the Electricity Act 1989

22. RenewableUK (October 2011), Consenting Lessons Learned: An Offshore Wind Industry Review of Past Concerns, Lessons Learned and Future Challenges, http://www.bwea.com/pdf/publications/RenewableUK_Consenting_Lessons_Learned.pdf

23. The Localism Act – Schedule 13 s10, http://www.legislation.gov.uk/ukpga/2011/20/schedule/13/enacted

as possible in providing advice and facilitating the process, without predetermining the application. Monitoring and review of consenting progress by the OWPB should help to ensure this is delivered.

3. Statutory Advisor Funding

With 16GW of projects expected to come forward over 2012-13, developers are concerned about the ability of key Statutory Advisors to consider and respond to applications given resource constraints. There are already a number of examples in which Statutory Advisors have been unable to respond to requests for information due to a lack of resources. The CRTF recommends that Government should ensure that Statutory Advisors are resourced sufficiently and given appropriate remits. In the short term, the industry and Government should focus on a solution for JNCC's resource shortfall.

4. Consenting of Test and Demonstration Sites

These sites are critical to bringing forward the next generation of turbines, but it is not clear that the process for developing and consenting these test sites has been looked at strategically. Industry has raised concerns that the length of time and level of effort to gain consent may not be proportionate to the risk. Recommendations to address this issue are given in the Innovation chapter.

5. Habitats and Wild Birds Directive Implementation Review

This review has made a number of recommendations (for England and Wales), which should be very helpful, if resourced adequately and implemented effectively. The CRTF supports the Government in implementing the key recommendations made in the review. In particular, clarity should be provided, as quickly as possible, on the use of IROPI for offshore wind. Also, a new process for agreeing evidence requirements and significance thresholds up front should be developed with industry. The OWPB should monitor implementation of recommendations quarterly.

6. Acceptability to Local Planning Authorities

Some recent local planning decisions have caused delays to the construction of nationally significant offshore infrastructure by rejecting planning applications for onshore elements. The OWPB should consider how best to work with local planning authorities considering onshore infrastructure for offshore wind, and consider any applicable best practice from other sectors.

The CRTF notes a perception that the consenting system for the Oil & Gas sector appears to be more streamlined than that for offshore wind. This suggests there is scope for the OWPB to explore best practice further with industry and regulators, with a view to further streamlining offshore wind consenting processes, especially as more experience is gained across the sector.

Conclusions

Consenting remains a major concern for the offshore wind industry. The Government has taken steps to improve the process, and this is welcomed by the CRTF, but it will take time before these changes deliver increased confidence. The CRTF urges Government to ensure that the changes have the intended effect, and believes that the recommendations put forward will allow Government and industry to work better together to address consenting issues, thus removing barriers to the deployment of offshore wind.

Chapter 5:
Grid and Transmission

Summary

Electricity transmission infrastructure typically accounts for around 10–20% of the capital costs of constructing an offshore wind farm and, to date, has been typically constructed by wind farm developers as part of integrated projects with the wind farms themselves. Under the licensing requirements of the Electricity Act 1989[24], these assets, where built by the Generator, are transferred post commissioning to a third party (Offshore Transmission Owner or OFTO) via a competitive tender process run by Ofgem.

We recognise there are a number of initiatives underway that are essential to reduce the cost of transmission and grid connections for offshore wind, such as development of coordinated network designs and associated anticipatory investment, as well as improving the OFTO process.[25] These are essential not only to allow the achievement of cost reductions but also to ensure that offshore wind can be seen as an attractive opportunity for developers and investors.

While well intended and welcome, such initiatives (and those around transmission charging and access, for example) can give rise to a significant degree of uncertainty about the future policy framework for offshore transmission. Such uncertainty can make standardisation and other cost reduction opportunities harder to achieve. Nevertheless, despite this challenging backdrop, there are opportunities to reduce the cost of transmission and grid connections, and to contribute to the £100/MWh target in the UK Renewable Energy Roadmap.

Following The Crown Estate/RenewableUK workshops held earlier this year, we identified a number of separate opportunities to reduce costs by better enabling grid connections, improving design efficiency and assisting in the expansion of the supply chain.

Task Force Key Recommendations

1. Government should engage with existing and new cable suppliers to identify possible measures to bring forward higher voltage HVDC polymeric cables. This would facilitate lower cost 1GW and 2GW HVDC connections

2. The industry should explore how to produce industry-wide project performance reports, potentially through the Offshore Renewable Energy Catapult Centre.

3. The Standardising body (discussed in the innovation chapter and possibly led by the Offshore Renewable Energy Catapult Centre) should review the potential for standardisation of transmission and substation modules. This group should have support from a technical group of experts with experience on standardisation matters such as the International Council on Large Electrical Systems (CIGRE)

4. RenewableUK's Offshore Grid Group to produce a paper by the end of 2012 on the potential role that a Design Authority could play in authorising the design of certain elements of offshore transmission and thus help promote standardisation and project de-risking. This would report to the OWDF to consider for potential further actions and would need to recognise the existing network planning role being carried out by National Grid as NETSO and the current ITPR review being undertaken by Ofgem

Approach Taken by the CRTF

Our work was informed by a group of experienced engineers and developers engaged in the connection of offshore renewables, who formed a working group under the auspices of RenewableUK. This group held workshops that were facilitated by The Crown Estate as part of their Offshore Wind Cost Reduction Pathways Study (TCE Study), and a member of the CRTF participated in the initiative.

We held two workshops in late 2011 and early 2012 in order to identify, describe and estimate possible specific opportunities that could lead to cost reductions, given certain conditions.

24 As amended by the Energy Act 2004. : The Electricity (Competitive Tender for Offshore Transmission Licences) Regulations 2010 set out the current legal framework and powers for Ofgem to run a competitive tender process.

25 In Northern Ireland, which is part of the Single Electricity Market (SEM) on the island of Ireland, the Northern Ireland Authority for Utility Regulation will consult, in due course, on an appropriate offshore transmission framework within the SEM to accommodate offshore projects in Northern Irish waters.

The first workshop produced a list of approximately 40 potential cost reduction opportunities in transmission, and considered at a high level their potential impacts.

Table 1: Shortlist of Major Cost-saving Transmission and Grid Opportunities

Opportunity	% Cost Reduction Potential	Priority
Anticipatory Investment	5 - 10% (of transmission costs)	Medium
Consenting and planning	5% (of project development costs)	High
Enabling a coordinated and integrated grid	10 - 20% (of transmission costs)	High
Optimising the OFTO regime	5% (of project development costs)	Low
Improvement of project visibility (linked to standardisation)	5 - 10% (of transmission costs)	High
Authorisation of designs	Enabler	Medium
Increasing subsea HVDC polymeric cable	Up to 30% (of cable costs)	High
Developing industry-wide performance reports	5 - 10% (of transmission costs)	Medium
Standardisation	Up to 10% (of transmission costs)	High

Footnote: It is important that the savings identified in this table are not considered as cumulative; some are mutually exclusive and some of the themes overlap, e.g., anticipatory investment is part of enabling a coordinated and integrated grid. Also, some of the cost reductions are for elements of the cost only, e.g., HVDC cables, which can typically represent 25% of the total transmission cost.

In the second workshop, the long list of opportunities was distilled into a manageable shortlist, and their details developed, focusing on the conditions needed for the opportunities to be realised, the timing of when the benefits could come into effect and the expected cost reduction impact.

The first group of items are those that are already covered by other initiatives (see Appendix 4) that the CRTF recognises as being significant in their potential to offer cost-saving opportunities, but which are considered to be dealt with sufficiently elsewhere. Specifically:

- Anticipatory investment is being covered by ongoing Ofgem study and consultations;
- Consenting and planning is covered elsewhere in this report;
- Enabling a coordinated and integrated grid forms part of the ongoing Ofgem/DECC process, plus Ofgem's recently announced ITPR project;[26]
- Optimising the OFTO regime, including alignment of the economic life of transmission assets in the OFTO licence with their design lives, is part of the scope of the Ofgem Enduring Regime consultation; and
- Improvement of project visibility, and subsequent benefits for the supply chain, is covered elsewhere in this report.

26. http://www.ofgem.gov.uk/Europe/Documents1/ITPR%20Open%20Letter%20-%20Final%20version%20-%2023%20March%202012.pdf

The four main items that were identified that are not part of the above ongoing initiatives are now discussed:

1. Higher-Voltage HVDC XLPE Cable

Increasing subsea HVDC polymeric (often referred to as extruded cross-linked polyethylene or XLPE) cable voltage ratings from circa 320kV available today to 500kV (for example) would facilitate lower-cost 1GW and 2GW connections through the use of fewer higher-capacity links. Additional aspects for consideration would be:

- Currently there is limited competition and capacity in the supply chain for HVDC XLPE cables, leading to long lead times. Increased competition or capacity would shorten lead times, allowing projects to connect sooner notwithstanding any onshore constraints.
- Some developments of higher-voltage HVDC XLPE cables have taken place in Japan; opportunities may exist to accelerate trials of such technology in the UK.
- Wider understanding of benefits of new technology (e.g., through shared experiences) may enable more informed decision-making by developers and sponsors.

The development of higher-voltage HVDC XLPE cable is likely to be in the strategic plans of suppliers but, given the significant impact of this technology, any possible measures to accelerate such development should be investigated further.

Acceleration of product development and the potential introduction of new suppliers could assist the delivery of these higher-voltage cables. In conjunction with the supply chain initiatives outlined in this report, it is suggested that Government engagement with existing and new cable suppliers be undertaken to identify possible measures, potentially accessing existing support schemes or simply providing greater market certainty, which could deliver these developments earlier.

2. Developing Industry-wide Project Performance Reports

Developing industry-wide performance reports would share best practice and better enable "learning by doing" to be incorporated into future projects. Practical examples could include:

- lessons from construction programme overruns;
- experience of working with different contractors/ effectiveness of contract management strategies;
- transmission system design issues;
- cable installation problems;
- cable landfall approaches; and
- learning from faults, failure and ongoing monitoring.

Those engaged in the design, delivery, and ongoing operation and maintenance of offshore transmission connections would need to agree which issues could be shared and the best industry forum for this to happen, recognising that a significant culture change may be required. An initiative is required to determine how such performance reports could be established and this could potentially be led by the Offshore Renewable Energy Catapult Centre. The experience of the Oil & Gas industry may be relevant here.

3. Standardisation

Standardisation of elements of transmission should lead to cost reductions in design, manufacture (including stockholding and lead time management), installation and Operation & Maintenance (including spares holdings, repairs and training) over the lifetime of a project.

Standardisation can occur through the sharing of best practice and may well be assisted by the establishment of a design authority.

Initially we believe there is scope to identify:

- those areas where benefits could result from standardisation, e.g., HVDC export voltage;
- how standardisation could best be achieved in those areas, e.g., through a CIGRE Working Group, UK-specific initiative or other such mechanism.

The establishment of information-sharing is likely to require a culture change in the industry and will require senior management buy-in, which we recognise may be difficult to achieve. The innovation chapter has already recommended that an industry-led Standardisation body be set up, potentially via the Offshore Renewable Energy Catapult Centre. This Standardisation body needs to consider grid initiatives and should be supported by a technical group of experts with experience on standardisation matters, such as CIGRE. Industry will also need sufficient support from Government to reinforce the political will.

4. Authorisation of Designs

Many offshore projects constructed to date have bespoke transmission connections and HVDC substation designs, leading to costs being higher than could be achieved via a standardised approach. We therefore propose that there should be further consideration of a defined role to authorise the design of certain elements of offshore transmission, to promote standardisation and project de-risking. Creation of such a "Design Authority" needs to be investigated to define duties that could

better facilitate standardisation and authorisation of offshore transmission projects. It is recognised that this authorisation could be performed by an existing organisation, with a suitable change to or clarification of its functions.

This has the potential to significantly de-risk projects for developers, supply chain, consenting authorities and financiers. To enable a Design Authority to be created further exploration is required:

- Political and regulatory will is required to establish such an authority or change the functions of an existing organisation. Changes may be needed to relevant legislation (e.g., the Electricity Act 1989).
- Acceptance of such a vision would require buy-in by all major stakeholders.

We therefore conclude that industry should initiate the first steps in this process and prepare a paper on the scope for such a design authority. Such consideration needs to recognise the existing network planning role being carried out by National Grid, in its role as NETSO (National Electricity Transmission System Operator) within Great Britain, and the current review being undertaken by Ofgem through its ITPR project. The industry-led review could report to OWDF on the potential benefits that such a Design Authority, with defined scope and function, could achieve. The CRTF considers that the Offshore Grid Group of RenewableUK would be ideally positioned to undertake the next steps in this process, given the cross-section of members that it represents, including developers, OFTOs and suppliers, as well as NG.

Conclusions

A number of actions have been identified, which we believe could be taken forward mainly by industry but with key assistance from Government.

We also suggest that the ideas are discussed further with Ofgem and DECC, so that they can be integrated with the existing initiatives being pursued by them. We welcome steps that have already been initiated in this respect and emphasise the critical importance of Electricity Market Reform in ensuring not only the right market framework for investment in offshore wind but also that opportunities for cost reduction, through optimisation of grid technology and standardisation, can be realised.

Chapter 6: **Finance**

Summary

The Offshore Wind Cost Reduction Task Force (CRTF) recognises that offshore wind is capital intensive, so the cost of capital is an important element in the overall cost of energy. This cost depends on a number of factors, for example, the perceived risk of the development and construction phases, the specifics of a project's location, the developer's experience, the regulatory regime and resource variability. Improving investors' confidence in the developers' ability to manage risks remains important, as the sector is relatively immature and still developing its track record.

Some of the actions discussed elsewhere in this report will help contribute to the reduction of financing costs. Of particular interest will be simplification of the construction phase by reducing the number of interfaces, and investigating alternative approaches to maintenance arrangements, either by securing longer-term manufacturer warranties or adopting revised provisioning practices for future maintenance obligations. If, however, the sector has to draw on more expensive sources of capital in order to achieve a timely roll-out of UK offshore wind, the cost of energy will be increased.

At present there are two opposing trends in renewables financing: there is a great deal of interest in renewable energy, but this is set against a background of the overall poor state of global financial markets and increasing regulatory pressures, which are acting as a deterrent to banks providing longer-term lending. However, the CRTF feels that offshore wind has a number of very attractive attributes that should allow it to access new, large pools of low/medium-cost institutional and industrial capital, as long as progress can be made in reducing actual and perceived risks, while refining capital and operational structures to ensure that specific risks are placed with those parties best placed to manage them. The role the insurance sector can play in providing risk management solutions needs to be investigated further.

Electricity Market Reform is probably the single most important issue for offshore wind at the moment. Getting it right is of fundamental importance across a whole range of issues, including financing the sector.

Task Force Key Recommendations

1. The industry should work to develop simpler innovative deal structures, especially during construction, which align stakeholders, including the Credit Rating Agencies, and deliver reliable long-term index-linked income streams. This is a complex task. We recommend the OWDF commissions a detailed investigation into how sufficiently transforming changes can be delivered quickly, drawing in financial and contracting expertise as necessary, by the end of 2012.

2. The Government (BIS) should deploy the Green Investment Bank (GIB) in the offshore wind sector as early as possible, which will facilitate and leverage the entry of new capital.

3. The industry and GIB, should investigate the development of vehicles for pooling wind assets, potentially on- and offshore, to provide risk diversity and facilitate the recycling of utility capital. DECC should take this forward, engaging The Crown Estate, OWPB and others.

4. The industry should engage the insurance sector to explore ways that their experience and product range can be used to help mitigate risks during construction and operation. The OWPB should initiate this.

5. The industry should encourage the entry of long-term risk capital into offshore wind, using the OWPB to lead the education and briefing of the finance sector. The OWPB should initiate this.

Evidence from The Crown Estate

As part of The Crown Estate's Offshore Wind Cost Reduction Pathways Study (TCE Study), PriceWaterhouseCoopers (PWC) produced a comprehensive finance report, which examines in detail the role that finance and insurance have in contributing to the aim of £100/MWh by 2020, based on a detailed analysis of the Weighted Average Cost of Capital (WACC) under various growth scenarios. Overall projections are that a modest reduction in the cost of capital to the sector can be reduced from the currently assumed 10.2% (based on a project reaching FID in 2011) to 8.9%, but this depends upon ensuring that significant capital can be attracted to the sector. To achieve this, potential investors need to understand and be comfortable with the specific risks faced within this sector, and be rewarded appropriately.

The PWC report divides the key prerequisites for cost reduction into four major categories (see below), and investigates the likely timescales to address them, which generally range from 12 to 36 months:

- Policy and regulation;
- Risk reduction;
- Attracting new investors; and
- Facilitating debt funding.

The report notes that in general, to attract those investors with the lowest cost of capital, the capital structure of future transactions will require a great deal of attention. This, in turn, will require a de-risking of financing structures. It may also be necessary to have a wider mix of financing products, with a subordinated debt tranche probably required.

PWC also notes the need to maximise equity funding by the existing utility developers, as well as recycling utility capital through leverage or by attracting new equity from financial and non-financial investors. The report discusses a range of detailed prerequisites for this.

Overall the report draws positive conclusions. However, these are based on the assumption that the cost of commercial debt, both for construction and operation phases, will reduce over time. With the changing regulatory environment for financial institutions, and their reduced appetite for risk, this may prove challenging.

Other Evidence

The CRTF received very useful input and challenge from DONG Energy (see the DONG Case Study later in this chapter), UK Green Investments, Morgan Stanley, Climate Change Capital, the Low Carbon Finance Group and DECC's Commercial Team. It also considered the OWDF report on financing. [27]

Evidence from the CRTF

The CRTF believes that PWC's forecast reduction in the WACC from 10.2% to 8.9% is realistic. The primary drivers of this are linked to the reduction in the risk premium that may be applied by investors should both (i) Electricity Market Reform be viewed as a credit-enhancing instrument, and (ii) the specific risk premiums in the installation and operation phases are reduced as the sector develops and demonstrates a successful track record.

The CRTF, while accepting the PWC premise that capital is generally available, feels that it is imperative to act now to attract new investors to the offshore sector if an investment hiatus is to be avoided. There is a feeling that regulatory changes affecting the banking market, in conjunction with pressures on utility balance sheets, are adversely affecting the availability of current sources of capital, and therefore the sector could face a greater financing challenge than envisaged.

Market Perception of a Cooling of Support

The CRTF notes a general perception in financial markets that support for renewables is cooling in several markets. Budgetary austerity and public debate about energy costs have caused policies to be reviewed. This follows damaging retrospective changes to renewable energy subsidies in specific European countries, in 2010–11, which focused investor attention on the policy and regulatory risk of investments reliant on government support.

It is understandable that policy-makers believe that affordability is a high priority. It is also important for financiers, who recognise that it is central to delivering policy stability. However, unplanned or unforeseen policy change creates a volatile environment that adds to regulatory risk, and therefore to the overall cost of investment. Designing policy with built-in, transparent flexibility to respond to changing external conditions (e.g., technology cost reduction) can improve stability.

Capital Conduits

There is debate as to what is the best conduit for getting capital into this sector, for example:

- Will the current use of complex structures involving minority interests (which comes with a higher cost of capital) ultimately facilitate the use of the listed equity markets?
- Should the industry progress directly to investors within the private placement debt capital markets or seek alternative investors, such as intensive energy users?

At present, only the largest pension funds have the capacity to invest directly into projects, with smaller funds requiring pooled investment vehicles. Collective investment vehicles, such as infrastructure funds, are available to smaller institutional investors, but high fee structures and leverage have made these less popular.

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

There is currently a lack of coherent investment vehicles or capital conduits for channelling long-term instruments into the offshore wind sector, especially ones that offer investors a simple and liquid investment combined with the necessary specialist understanding of the technicalities behind offshore wind development and operation.

Other asset-heavy industries, such as aircraft or rolling stock leasing companies, can provide examples of such a conduit; these sectors have been able to access public and private capital markets on a regular basis. A specialist, listed asset management vehicle for offshore wind could be created, perhaps as a joint initiative between UK Green Investments and other financial organisations. It could provide an effective capital channel if it could demonstrate a detailed understanding of how to manage and mitigate risk. It would be important for it to aggregate a number of investments to provide a diverse portfolio of wind farms for investors, which would reduce turbine-specific, wind and other risks.

If the construction and operation phases are to be financed as distinct phases, to take account of the differing risk appetites of banks or investors, then thought will need to be given to how instruments such as long-term interest rate hedges can be structured to allow this financing split to be accommodated at financial close. For example, equity investors (or provisions within the Contract for Difference/Feed-in Tariff) may need to allow for interest rate adjustments to be made at commercial operations date. The current review of Private Finance Initiative/Public–Private Partnership funding structures and how they are seeking to solve a similar problem may provide a useful insight.

Credit Rating Agencies

Two areas of focus for the Credit Rating Agencies (CRAs) are key issues for the sector:

a) treating utilities' off-balance-sheet debt as though it is on balance sheet; and
b) potential ratings for future projects that may seek access to debt markets.

The current CRA opinion that debt associated with offshore wind projects must be consolidated on to utilities' balance sheets for rating purposes (even if the debt has been created in such a way that it would normally be considered off balance sheet) is based on the assumption that utilities will not allow a project to fail. This credit treatment is leading to more complex ownership structures being used, which will not facilitate a mass introduction of lower-cost capital to the sector. Electricity Market Reform may be an opportunity to see if the CRAs are able to reconsider their current approach.

The second area of focus are the CRAs' parameters for rating transactions that are being structured to access the "Project Bond" market, for which an investment-grade rating is highly desirable. To achieve this, the sector will have to provide robust, longer-term evidence and statistical data, as well as revised contractual structures that take account of the various rating guidance notes in relation to the credit standing of counterparties, and requirements for robust resource data. For example, a good starting point would be for the wind industry to agree a standard with the CRAs for the collection of "long-term hub height wind data" that can then be universally applied for financing purposes.

Industry engagement with the CRAs is important in order to establish a clear understanding of the ratings process in the light of the ongoing Electricity Market Reform.

Educating the Finance Industry

The scale of capital needed to build out the UK's offshore wind means that there is a need to attract new investors from both the trade and financial sectors. New investors will be concerned about more than just the rate of return; they will need to be reassured that risk is being well managed.

While problems can be expected in any growing industry, to gain trust and unlock investment capacity the drip-feed of bad news into credit committees needs to be replaced by a more comprehensive and transparent story covering all aspects and showing that lessons have been learned.

The offshore wind industry needs to examine closely how it educates the financing community. The OWPB should consider who should design and deliver this initiative.

The Role of the Green Investment Bank

The GIB has a crucial role to play in supporting the build out of Round Three.[28] It also needs to make a difference in Rounds Two and 2.5, on which it can build for Round Three.

The Government is clear that the GIB must be sustainable; therefore, it is very unlikely to assume risks that a commercial party would not. Nevertheless, if the GIB offers a range of products from co-equity investment to senior debt facilities,

28. GIB: http://www.bis.gov.uk/greeninvestmentbank

it can play a powerful role in providing reassurance to other investors, and hence improve the overall investment framework.

The immediate areas that the CRTF would like the GIB, in conjunction with the sector, to consider are:

- Investigating the viability of an aggregating/financing vehicle, able to make long-term equity investments, to reduce the debt level for utilities' projects. In due course, such a vehicle could itself access debt capital markets.
- Using subordinated facilities to reduce construction-phase risk.
- Amending the capital structure of transactions during the operational phase to enable access to lower-cost financing from long-term capital markets.
- Working with the European Investment Bank and other multilateral lending organisations to access their funding programmes at scale.
- Working with the OWPB to create an effective forum for investor education.

Case Study:
Diversifying Funding Sources – DONG Energy

DONG Energy has developed a growing reputation for systematically attracting more risk-averse financial investors as co-investors into projects. DONG Energy recently competed a transaction for the sale of an equity stake in its Borkum Riffgrund project in Germany to the Oticon Foundation and to Kirkbi A/S (the Lego parent company), which adds to an impressive track record including bringing PensionDanmark, PGGM, PKA Ltd, Ampere Equity Fund, Marubeni and Masdar into the sector.

DONG Energy intends to continue this approach and is seeking to "industrialise" the investment process for both equity and debt partners. It sees itself as flexible and able to use innovative structures to de-risk its assets to meet investor requirements.

DONG Energy uses bespoke structures (designed to work with or without debt financing) and has addressed four key areas:

- **Construction** – In the UK to date, investors have been reluctant to accept full construction risk. In order to optimise acquisition pricing, where assets are divested before completion, DONG Energy has offered a construction agreement that acts as an "EPC wrap", whereby they offer a fixed price with a fixed delivery date, protecting investors from the majority of cost overruns and delays.

- **O&M arrangements** – DONG Energy is able to offer long-term O&M agreements that initially sit alongside the Service & Warranty Agreements and ultimately replace them, in order to give some certainty to investors as to the quantum of scheduled O&M costs, which is attractive to both investors and financiers. By working closely with the wind turbine manufacturer, DONG Energy has been able to mitigate the O&M exposure, to some degree, through Service & Warranty Agreements for the early years of projects.

- **Power price structures** – In the UK, DONG Energy provides its investors with long-term arrangements for both power and ROCs, thus offering stable, predictable cash flows.

- **Aligned incentives** – DONG Energy believes it can offer investors an experienced partner, with aligned incentives, seeking the long-term success of its projects.

To date, DONG Energy has helped finance its expansion by divesting minority stakes in fully consented wind farms. However, there are challenges still to be faced with this approach:

(i) The pool of investor capital available for equity investments is expected to shrink given the restrictions on owning transmission and generation assets under the Third Energy Package,[29] and given the impact of Solvency II on the pension and insurance fund markets.[30]
(ii) The impact of the credit crunch and Basel III on project finance lending means that investors in UK projects that require leverage find it challenging to obtain traditional project finance, although it is still available. [31]
(iii) Each divestment is a time- and cost-intensive process.

29. The Third Energy Package requires unbundling of energy supply and production from network operations
30. Solvency II will set out new, stronger EU-wide requirements on capital adequacy and risk management for insurers. It introduces an explicit requirement for insurers to hold capital to protect against market risk embedded in their investments. The result of such changes could mean that insurers will prefer investing in shorter-term quality assets.
31. Basel III contains, amongst other things, measures aimed at making the banking system safer, by increasing the amount and quality of equity capital buffers to absorb shocks, decreasing the reliance on volatile short-term funding, and protecting against short-term demands on liquidity.

As such, DONG Energy has emphasised the need for structures to be developed that enable offshore wind projects to access the debt capital markets, with their greater liquidity and cheaper pricing, as it is this that will enable developers and investors to finance their projects long term, at a sustainable price. This has also been recognised by multilateral financing institutions, including the Green Investment Bank and the EU Project Bonds Initiative, but material obstacles still remain.

Nevertheless, the progress DONG Energy has made is a positive demonstration of the sector's attractiveness to new investors and of what can be done. If other developers follow, these initiatives can provide an alternative model for developing a longer-term capital conduit.

Conclusions

Certain actions that the industry is taking for other reasons, such as trying to reduce risks during the construction phase, will have positive effects on the availability and cost of finance. In addition, there are specific actions that the industry can take to engage with the finance community directly, including scope for innovation and contracting structures. Government can help with all these and must, more directly, ensure that plans for UK Green Investments/GIB are sufficiently ambitious and prompt-acting to fulfil their potential in attracting the very large sums of capital the sector needs to deploy so as to achieve economies of scale and meet 2020 targets.

Appendices

Appendix 1:
Membership of the Offshore Wind Cost Reduction Task Force

Name	Company & Position	Sector
Andrew Jamieson	ScottishPower Renewables, Director of Policy and Innovation; Chair of RenewableUK	Chair of the CRTF
Thomas Arensbach *	Gamesa – Director of Offshore Markets and Project Development	Turbine manufacturer
Steve Burgin	Alstom UK – UK President	Turbine manufacturer
David Clarke	Energy Technologies Institute – Chief Executive Officer	Innovation
Ron Cookson	Technip – Senior Vice-President, Technip Offshore Wind	Installation and construction
Michelle T. Davies	Eversheds – Partner and Head of Clean Energy and Sustainability	Legal
Tom Delay	The Carbon Trust – Chief Executive Officer	Innovation/Supply chain
Christoph Ehlers	Siemens Wind UK – Managing Director	Turbine manufacturer
Andrew Garrad	GL Garrad Hassan – Chairman and CEO	Cross-sector expertise
Chris Hill	Mainstream Renewable Power – General Manager SMart Wind Ltd	Developer
Chris Jones	Sinclair Knight Merz (SKM) – Technical Director, Networks	Grid and Transmission
Fleming Ougaard	Vestas Systems A/S – Chief Operating Officer and Senior Vice-President of Operations	Turbine manufacturer
Christian Skakkebaek **	DONG Energy – Senior Vice-President, Country Manager UK	Offshore developer
Mike Straughen	Wood Group – Group Board Director	Oil and Gas
Alan Thompson	Centrica – Director of Renewable Energy	Offshore developer
Ed Wilson	Lloyds Banking Corporate Markets – Head of Renewable Energy	Financial institutions

* Replaced by Dr Dirk Matthys, Gamesa, Chairman for Northern Europe
** Replaced by Benj Sykes, UK Operations Director, DONG Energy Windpower

Appendix 2: **Low Carbon Innovation Co-Ordination Group (LCICG)**

The Low Carbon Innovation Co-ordination Group brings together the major public-sector-backed funders of low-carbon innovation in the UK.

Its core members include DECC, BIS, the Carbon Trust, the Energy Technologies Institute, the Technology Strategy Board, the Engineering and Physical Sciences Research Council, the Scottish Government and Scottish Enterprise. Several other organisations, including the other devolved administrations, have recently joined as associate members.

The group's aims are to maximise the impact of UK public-sector funding for low-carbon energy, in order to:

- deliver affordable, secure, sustainable energy for the UK;
- deliver UK economic growth; and
- develop the UK's capabilities, knowledge and skills.

The group has been working together on a number of work streams, including the Technology Innovation Needs Assessment (TINA) project. This project aims to identify and value the key innovation needs of specific low-carbon technology families, including offshore wind, to inform the prioritisation of public-sector investment in low-carbon innovation.

The LCICG worked with representatives from the offshore wind industry to ensure that the most robust data possible was fed into the TINA process.

The Offshore Wind TINA Summary Report, published in February 2012, shows that offshore wind has tremendous potential to reduce the UK's reliance on imported fossil fuels, and to help meet renewables and carbon reduction targets. It also highlights the importance of innovation for cutting the cost of offshore wind and delivering benefits to the UK economy.

Appendix 3: **Alliancing Principles**

Alliancing is a contracting strategy that aligns the goals of the project developer and partners with contractors, vendors and suppliers, to minimise cost, increase profitability and better manage risk. There is a spectrum of Alliancing approaches, but in its purest form an Alliance involves full cross-company integration, openness and cooperation. An integrated and seamless project team of developers, designers and contractors is established, while traditional interfaces are eliminated, as all parties are responsible for the single project objective. Commercial terms are equitable, with the risks and rewards designed so that if the project performs better than expected all members of the Alliance share in the gain, independent of individual contribution. Conversely, all members share in the risk of the project performing badly. Risk and reward may not be shared linearly across the parties. Risks should be accepted and therefore also rewarded by the party that is best capable of managing and influencing the outcome of that risk.

An Alliance requires substantial trust, with all parties agreeing to cooperate to achieve the common goals and objectives of the project, from the early stages of preliminary engineering through to offshore installation and commissioning, and ultimately life-of-field operations. Experience, ability to perform and financial robustness will therefore normally be prerequisites for being part of an Alliance, as is the need for clear and aligned leadership to help build trust. Substantial cost savings and technical benefits can be gained by making maximum benefit of the skills available within individual companies and the Alliance membership as a whole. Alliances vary on a case-by-case basis and can be designed to deliver a single project (Project Alliances) or multiple projects over time or space (Strategic Alliances).

Compared to traditional contracting approaches, Alliancing typically requires a different and more transparent approach to price discovery and distribution of profit. Overcoming cultural issues and aligning incentives requires drive and is challenging.

The table below, which is not exhaustive, illustrates the different contracting approaches possible:

Contracting Approach	Behavioural Themes	Behavioural Trends
Traditional	• Competition • Project Based • Risk Transfer	• Each side has clearly established responsibilities • Little or no trust • Disputes often resolved adversarially
Project Partnering	• Cooperation • Project Based • Risk Mitigation	• Each side knows and commits to the goals of the project and to each others' goals • Requires a degree of trust • Disputes typically resolved in some degree of compromise and harmony
Supply Chain Partnering	• Collaboration • Long Term • Risk Mitigation	• Integrated supply chain team focused on meeting programme goals • Usually design and build • Often create a separate legal entity to contract with client • Team has one set of goals for a successful programme with some shared risk/reward • Senior level "sponsors" to remove barriers and support the project
Client Partnering	• Collaboration • Long Term • Risk Sharing	• One integrated team consisting of both client and contractor personnel • Early involvement in design life cycle • Requires a high degree of trust • Team has one set of goals for a successful programme with shared risk/reward
Full Alliancing	• Coalescence • Long Term • Risk Embracing	• Integrated into whole project life cycle • Total alignment around driving a mutual goal and sharing gains and liabilities for failure • Both sides share their goals and cost • Requires extremely high trust

Appendix 4: Regulatory Grid Initiatives with Implications for Offshore Project Costs

Initiative	Description	Objectives	Lead	Timing
Offshore Transmission Coordination Project	A project to assess the potential costs and benefits from coordinated configurations, identify any barriers to their development and introduce measures to overcome any such barriers. Scope includes: anticipatory investment; network optimisation (including SO's existing system planning and ODIS obligations); consenting; risk/reward incentives; regulatory interfaces; and technology.	To ensure that the offshore transmission regulatory regime fully captures coordination as well as competition benefits, and to minimise costs to generators and consumers.	DECC/Ofgem	Conclusions published and consultation launched on 1 March 2012
Integrated Transmission Planning and Regulation (ITPR) Project	This project will consider what is needed with respect to system planning, to deliver the future integrated transmission onshore, offshore and cross-border, and will review how the relevant institutions and the incentives around them should evolve.	The project will consider how the onshore, offshore and interconnector regulatory regimes interact to deliver multipurpose transmission projects, and will seek to ensure regimes continue to provide effective and stable frameworks for the significant investment in transmission infrastructure that is required in the future.	Ofgem	Recommend-ations to be published early 2013
North Seas' Countries' Offshore Grid Initiative (NSCOGI)	A two-year project between nine North-west EU Member States and Norway, to assess the costs and benefits of different international offshore grid configurations and identify any technical, regulatory or planning barriers.	To identify a series of plausible scenarios for offshore grid infrastructure in 2030, tackle barriers to grid development, and facilitate strategic, coordinated development of the onshore and offshore grids, ensuring cost-effective and sustainable investment.	Nine EU Member States, including the UK (DECC with Ofgem Support), and Norway	Final report to ministers due end 2012
Enduring Tenders Project	A project to provide further details of the tender framework for enduring OFTO-build and Generator-build projects. Likely to lead to a revision of the Tender Regulations in late 2012.	To ensure deliverability of the OFTO-build and Generator-build options and capture benefits from innovation and competition, leading to savings for consumers and reduced charges to Generators.	Ofgem	Consultation process launched 16 Dec 2011
Project TransmiT	A project to review the effectiveness of the transmission charging regime in delivering Government energy targets. Could lead to changes to the methodology governing the current charging regime.	To ensure that the transmission charging regime will facilitate low-carbon generation while maintaining security of supply and keeping down costs to the consumer.	Ofgem	Ofgem has published their final recommend-ations and instructed industry to proceed with implementation for 2013
Electricity Networks Strategy Group (ENSG)	A high-level forum, which brings together key stakeholders in electricity networks working together to support Government in meeting the long-term energy challenges of ensuring secure, clean and affordable energy. It is jointly chaired by the Department of Energy and Climate Change and Ofgem.	To develop and promote a high-level "vision" of how the electricity networks could play a full role in facilitating the renewable and low-carbon generation necessary to meet the 2020 renewables targets and longer-term energy and climate change goals. To maintain an overview of activities and developments that have potential to impact on the realisation of the high-level "vision".	DECC/Ofgem	Updated 2020 Vision Report published February 2012
RIIO (Price Control Review)	Transmission Network Price Control Review for 2013-21. Sets out potential onshore network reinforcements (including those needed to accommodate offshore generation) and other activities to be undertaken by three onshore GB Transmission Owners, which would require funding, in part, by Generators, recovered through the transmission charging mechanism.	To set a long-term framework for network development and incentivise the network companies to meet outputs that help deliver a secure, sustainable and cost-effective network. This includes network investment and connections to help meet 2020 targets.	Ofgem	To be implemented from April 2013

Appendix 4 continued:

Regulatory Grid Initiatives with Implications for Offshore Project Costs

Initiative	Description	Objectives	Lead	Timing
'Connect and Manage' Grid Access Reforms	DECC introduced a new enduring 'Connect and Manage' grid access regime, enabling new generation to connect quickly. This built on the successful interim arrangements introduced by Ofgem, and has provided greater long-term certainty for new Generators about the grid access rules. So far, 73 large generation projects (26GW) have advanced their connections by an average of six years.	To provide sustained, commercially viable connection opportunities and firm connection dates reasonably consistent with project development timescales.	DECC	Implemented in Aug. 2010
CMP192 – user commitment liabilities for new and existing Generators	National Grid has developed proposals through the normal industry governance process to change the arrangements for new and existing Generators' financial liabilities relating to new transmission capacity.	One of the intended benefits of the proposals is the removal of perceived barriers to connection for new Generators.	Ofgem/ National Grid	Ofgem published its decision on the proposal on 30 March 2012
EU Codes	The development of legally binding Network Codes covering cross-border issues such as interconnection, cross-border trade and cross-border system operation and interaction.	To agree common approaches to network regulation, to facilitate cross-border trade of electricity within the EU and implement the Third Energy Package.	Ofgem/ National Grid through ACER and ENTSO-E with DECC having final sign off via comitology	Different Codes develop on different timescales, with final implementation of all before 2015

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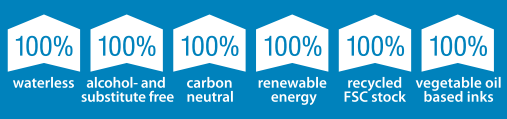

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