

The UK Offshore Wind Industry:

Supply Chain Review

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A report by **Martin Whitmarsh** into the UK Offshore Wind Supply Chain.



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1. Executive Summary

Offshore wind can provide a cost effective and low carbon route to providing at least 50% of the future electricity demands of the UK. The offshore wind sector has matured rapidly over the past few years in the waters around the UK and it is now capable of providing a reliable supply with proven technology. If government can now provide a long-term strategy and commitment to the sector, it is reasonable to expect private investment to continue to fund the growth of the UK offshore electricity generation capacity, with projects becoming subsidy-free in the 2020s.

The development of UK offshore wind capacity has been largely achieved by harnessing the knowledge and expertise that had been developed in countries such as Denmark, Norway and Germany. Pioneering foreign companies have pushed the technology within UK waters and we should be extremely grateful for what has already been achieved in growing the UK's installed capacity, whilst significantly increasing efficiency and bringing down costs. Furthermore, approximately 11,000 long term skilled UK jobs have been created by this partnership with these excellent and expert businesses. However, the UK offshore wind industry needs to seize the huge export opportunity which will inevitably follow from what has been developed and proven around our shores.

Efforts to support and create traditional manufacturing employment will probably not generate export opportunity and it is important therefore that the sector and UK companies are encouraged to innovate and create valuable intellectual property, which can create enduring economic benefit and export opportunity. Seeking to place traditional manufacturing industry on a level playing field with foreign state assisted competitors who are frequently protected within their own markets, is likely to be unsuccessful in the long term.

Any long-term industrial strategy intending to develop a vibrant, balanced and successful economy should concentrate on the development and UK ownership of valuable intellectual property and project integration skills, particularly if it is seeking to achieve export revenues.

We live on a densely populated island with windy shallow seas around us and consequently the opportunity to lead the world in the deployment of offshore wind energy is obvious and exciting. The UK already has the world's largest deployment of offshore wind energy and it is now established as the lowest cost route to large scale low carbon electricity generation. If the UK is to meet its carbon emission reduction targets and provide the energy to drive our economy and society forward, we must continue and accelerate the incredible technical and operational achievements of the Offshore Wind Energy sector. However, to achieve the growth required in offshore wind, we must convince many more UK businesses to commit to the sector and build the supply base required to support the industry going forward.

The UK has proven to be a great place to innovate for many other sectors and we should now encourage businesses to embrace the opportunities in offshore wind, establish knowhow and global competitiveness to create enduring employment and export revenues as the worldwide market opportunity accelerates.

In view of the very ambitious scale and cost targets now being set for the offshore wind sector, UK business needs to step up and provide a competitive offering and complement the existing supply chain. Furthermore, UK companies need to be encouraged to offer innovative and cost-effective services and technology to the sector. If this can be achieved, UK businesses and the overall economy can greatly benefit from the substantial offshore wind export opportunities that are now opening throughout the world.

2. Introduction

The Offshore Wind Industry Council (OWIC) commissioned this Supply Chain Review to establish an independent perspective on the current offshore sector supply chain and to make recommendations to encourage the development of a successful UK industrial sector, which should be capable of making a significant contribution to the nation's energy requirements, whilst encouraging economic growth and prosperity.

Member organisations of the Offshore Wind Industry Council provided Martin Whitmarsh with the part-time assistance of some experienced professionals to conduct this supply chain review. Following several meetings to review existing data, it was decided that the team should reach-out to the existing UK supply chain and potential new suppliers to the sector. To facilitate this approach, the team, with the significant assistance of ORE Catapult, produced the Offshore Wind Industry Prospectus seeking to set-out the opportunities for UK business (Appendix 1) and this was circulated to the known supply chain and technology businesses within the FTSE250 (circulation list in Appendix 2).

To further engage with the supply chain and seek feedback from SME's in particular, the team with the support of OWIC, RenewableUK and ORE Catapult organised six roadshow events around the United Kingdom. Invitations were sent to the known supply chain, LEP's, Catapults and trade associations. (Roadshow details and feedback is summarised in Appendix 3). In addition, a dedicated mailbox to capture questions and feedback was created and is currently managed by ORE Catapult (OWICsupplychaindevelopment@ore.catapult.org.uk).

Following on from analysis of existing information and feedback from the supply chain and the roadshow events, the team have made a range of recommendations which are contained within this review and are directed towards government, OWIC and the industry.

3. Guide to this review

This document provides a range of recommendations for the industry to consider based on a view of the offshore wind industry globally and in the UK. These observations are discussed throughout sections 4 to 12 and followed by a summary of opportunities and barriers for the UK Supply Chain. The report concludes with recommendations.

4. Overview of Offshore Wind Energy

The UK Offshore Wind Energy market is an unseen success story with the largest existing deployment in the world. It has proven technology and is already providing 8.5% of the UK's electrical energy and this will rise to 35% by 2030 with a capability of providing 50% of the UK's demand in future. The cost of electricity from upcoming offshore wind projects has fallen by 50% in just two years and it is now the most cost-effective low carbon route for large scale generation in the UK. Forecasts indicate there will be £2.5 Trillion global investment in wind energy (on and offshore) by 2040 providing further evidence that now is the time to invest in the sector.

5. The Challenge Going Forward

The National Grid 'Future Energy Scenarios (FES) 2018' indicates that the UK electricity peak demand could be as high as 85GW in 2050, compared to circa 60GW today. This prediction assumes a substantial growth in electric vehicles and the progressive decarbonising of domestic and industrial heat and power requirements.

If offshore wind is to provide 50% of the UK's projected electricity demand by 2050 and acknowledging that deployed systems currently have a productive life of ~25 years, the sector must deploy, on a continuous basis, greater than 2GW/annum to grow from today's capacity to 50GW by 2050.

If investors and industry become confident that the government will establish and maintain a commitment to the roll-out of greater than 2GW of offshore wind energy each year, they will be able to justify the significant investment required to develop skills, technology and facilities to meet the demand. Clear sight of this demand, with mechanisms to promote and maintain competition, will ensure that the efficiency and cost competitiveness of the sector will continue to be developed.

However, in order that the offshore wind sector is able to achieve this ambitious deployment rate, whilst continuing to grow UK employment and export opportunities, the supply chain will have to develop significantly in order to become globally competitive.

6. The Future of Offshore Wind in the UK

The UK currently has 20GW of installed wind energy capacity with 8GW offshore and a current future offshore pipeline of either consented or announced capacity totalling 44GW. The offshore wind sector currently provides circa 11,000 long term quality jobs around the UK and is projecting 27,000 by 2030. The next 10 to 15 years will prove critical for the UK offshore wind industry with a number of opportunities (fixed and floating) to grow and excel on the horizon.

6.1 Review of Developers and Operators

A competitive field is essential to drive costs down, it is however important that any new entrants are credible, long term players who either have the appropriate experience or partner such organisations.

Developers like Ørsted at Burbo Bank and the Carnegie Road Project and Vattenfall at Pen y Cymoedd are beginning to establish battery storage projects in the UK. These will provide learnings for future applications in the offshore wind sector. To date, these projects are to provide frequency response services to the grid to manage stability at times of low and peak demand rather than 'energy storage' as is commonly understood. There is an opportunity for the smaller utility providers (OVO and others) to position themselves as partners in establishing battery storage projects together with offshore wind developers, as well as developing more innovative storage solutions.

The sector will see more consortia – eg Blauwind (formed of Partners Group, Shell, DGE, Eneco and Van Oord), which won Borssele III and IV. However, joint ventures in offshore can be complex with different objectives, approach to risk, timeframe, etc.

The maturing nature of the industry and the move to larger projects are driving financing models which are bringing in infrastructure investors looking for long term returns. To date, operational assets have largely been the focus for investors. However, the world's largest offshore wind divestment was the sale of Hornsea 1 during early construction in 2018; 50% for ~£4.5bn in 2018. It is anticipated that investor focus will shift towards the construction/development phases of offshore wind projects as they become less risky with learning and sector maturity.

There are very few established offshore wind developers headquartered in the UK. Other than SSE who are very active in both the on- and offshore wind sectors, the closest candidate was Centrica who recently pulled out of offshore wind entirely through a restructure of their business and adjustment in strategy.

Ørsted (a Danish company) currently has the largest UK offshore wind portfolio by owner share (~24%). Other companies who own a significant proportion of the current offshore capacity deployed offshore include Vattenfall (~13%), SSE (~12%), Iberdrola (~11%) and Innogy (8%). These companies have thrived through the changes to funding for offshore wind that the UK has undergone.

6.2 Prime Contractors (Tier 1)

The project developer will typically procure the design, supply and installation of turbines from the turbine OEM and one or more Tier 1 equipment and installation contractors. In other cases, some developers choose to multi-contract, using in-house or contracted-in expertise to manage up to 100 direct contracts.

Contracts for manufacture and construction are often signed two years before construction although in some cases, large supply contracts are sourced earlier via strategic framework agreements or strategic company alliances. Contracts for the manufacture of balance of plant equipment and installation services may be signed later than turbines but designs are finalised early on in this process.

The offshore wind supply chain has a strong cohort of major component suppliers which contract directly with project developers. This top level of supply chain commonly referred to as Tier 1, typically supply Wind Turbine Generators (WTGs), Foundations, Substations (onshore & offshore) Export and Array Cables.

The 8GW of UK offshore wind capacity currently spans 30 projects with over 1,900 foundations installed in UK waters since 2004. Despite these vast numbers the source of fabrication for Wind Turbines and foundations has been shared between a limited number of fabricators.

The WTG market, in particular, has been dominated to date by key players Siemens Gamesa (formerly Siemens) and MHI Vestas. Next generation turbines of greater size and capacity are being brought to the market by competing parties such as GE Renewable Energy, but the number of suppliers competing for wind turbine supply is still limited.

The global growth in offshore wind has the potential to encourage more wind turbine suppliers to the market. Developing the expertise needed to win contracts in this market could be considered similar to large-scale manufacturing industries such as aerospace. Therefore, the scale of investment from a new entrant would be challenging and given that the reward can take several years from contract award to installation to be realised, it seems unlikely a new entrant will emerge in this decade. A more likely scenario may be partnering with a Tier 1, Tier 2 or Tier 3 player in the manufacturing supply chain or alternatively taking part ownership of a site in a familiar market to develop understanding of the contracting and project delivery first.

6.3 Principal Suppliers (Tier 2)

The foundation fabrication market is similarly constrained, with Sif Offshore Foundations, EEW SPFC and Bladt taking the major share of the market for installations between 2013 and 2016, not just in the UK but the European market too. Fabricators from outside Europe have demonstrated a growing interest in the UK market and may offer lower costs potentially enhanced by state subsidies. This could put UK suppliers at a substantial disadvantage and is a concern among local fabricators.

Factors limiting new competitors entering the market for foundation fabrication include; access to sizeable quaysides with significant water depths for large scale manufacturing, load out to site, and demonstrated experience in delivering a serial production of offshore structures, as well as a readily available skilled workforce. It is possible that with new leasing rounds, the site conditions in future are more complex and require a mixed design of foundations. In addition, bigger wind turbine models will mean sites can be designed with

fewer foundations. These factors could mean the most cost-efficient option in future is for a combination of yards to deliver a varied order of jackets and mono-piles. If the supply chain sees an opportunity to reduce costs by partnering with smaller yards, then the expertise in delivering this scope will spread across the supply chain.

The export and array cable market in the UK and Europe has more variety than that of wind turbines and foundations, however JDR Cables has proven a dominant player in the array cable supply market. Prysmian is in the process of establishing the first submarine array cable core manufacturing facility in Wrexham and will supply the Hornsea 2 project. Export cables, currently not manufactured in the UK, are also one of the key areas targeted by suppliers, not just the offshore wind market but also the interconnector market for large scale orders. The installation plans for export cables and interconnectors in the early 2020's, including the move to high voltage DC technology, could be constrained by the number of sites able to manufacture and test the cable to the industry requirements creating an opportunity for new entrants or partnering with current players to provide investment and expansion to their current facilities.

Often the onshore cable routes and infrastructure created by offshore wind projects is forgotten. Many UK civil engineering contractors deliver significant scopes for offshore wind farms. Companies such as J M Murphy's, Balfour Beatty and Volker Infra undertake significant onshore construction projects for UK windfarms, including the onshore cable routes to existing substations. The breadth of experience within the UK Civils market can offer a very attractive solution without the need for overseas suppliers.

Offshore Topside structures for the conversion of turbine power prior to transmission to shore are often manufactured in UK fabrication yards, e.g. Heerema Hartlepool, Burntisland Fabricators (BiFab) and Harland and Wolff. A key challenge for these fabricators is to remain competitive with prices from other suppliers across Europe and the World.

6.4 Specialist Suppliers (Tier 3)

The UK offers a significant number of smaller suppliers who can adapt very quickly to the market and offer solutions for the industry. This provides a large level of Tier 3 Intellectual Property (IP) ownership across the industry, the key challenge being how to incorporate that IP into the larger Tier 1 and Tier 2 suppliers. Noteworthy examples exist in small sensor companies such as FT Technologies who supply sensors into 70% of the world's offshore wind turbines.

The UK provides a significant number of smaller components and technologies to the Tier 1 suppliers. These smaller success stories often go unnoticed, but in reality, they are critical to the supply of the components and to the operation of the windfarm. Further knowledge sharing of experience in entering the offshore wind supply chain should be used to support new entrants.

Granada is a successful UK supplier of Davit cranes fitted to foundations. They are regularly used offshore and provide a service to supply and maintain the equipment with the

provision of personnel. Such companies are now facing the challenge of growing supply rates as the market develops.

The UK supply chain also owns a significant proportion of the market for offshore marine coordination. This software provision, whilst able to be replicated, often requires a significant level of development for which the UK has a very high level of experience. Global deployment of this software is possible and opens avenues to companies such as SeaRoc to provide solutions across the market. SeaRoc has long term agreements with several offshore wind developers for this provision.

For Tier 3 suppliers, entry to the market is difficult and the new suppliers often state that they find it difficult to identify the appropriate contact within the supply chain to provide their solutions. In addition, a rigorous system of entry to the market can often create difficulties for new entrants to gain access to Tier 1 suppliers and project developers to successfully sell their products. This entry process would need to be simplified to enable new technologies and IP to thrive within the sector. The prize for greater participation by innovative UK-based suppliers is not only an expanding domestic market, but also significant export opportunity in the rapidly expanding global market.

6.5 Field assembly, maintenance and operations suppliers

The operations and maintenance of offshore wind farms offers a compelling opportunity for both high-value employment, and significant UK supply chain penetration. Potential suppliers will need to navigate the range of business strategies deployed in the operations phase; from the initial service and warranty phase which has historically typically been for five years, where OEMs maintain the turbines and the developers (in-house or through a contractor) maintain the balance of plant. After the initial service and warranty phase a further range of strategies can be found within the sector, namely; long term service agreements (LTSAs) with OEMs (or potentially independent service providers), in-house by developers, or multi-contract or a combination thereof.

As the installed capacity grows in the UK, and developers take forward multiple projects, we are seeing the industrialisation of offshore operations and maintenance (O&M). Developers and the supply chain seek to deliver value through scale and bundling of services in order to improve the utilisation of service technicians, facilities, equipment, vessels and helicopters. An ongoing commitment to further improve the safety record of the industry is a further driver to do things differently. The recognition that business as usual will not lead to success represents an excellent opportunity for both existing supply chain companies as well as disruptors to develop globally competitive O&M experience, know-how and technology in the UK that can be exported worldwide.

The UK has significant experience in subsea UXO (unexploded ordnance) detection and removal. This capability is essential to the development of windfarms and provides a unique entry for UK companies who can provide remote survey and ordnance removal technologies. A number of Oil and Gas specialist companies are supporting windfarm

development with new tools and the expectation is that with further offshore construction into 2030 this requirement will expand.

The UK supplier market for offshore installation vessels, such as Seajacks, supply several jack-up vessels to the UK and European market and are a good example of the expertise in installation technology and provision of vessels for the offshore wind industry. Challenges facing vessel suppliers come not least from the sector's rapidly evolving technologies and installation requirements, meaning investment decisions for new vessels are difficult.

This offshore large installation vessel market is wholly driven by either large speculative investment to create new vessels or a large amount of funding from banks to invest in the vessels themselves. The main barrier to entry here for UK companies is the early upfront costs and then the experience to construct. The opportunity for Oil and Gas vessel owners has opened up in the oil and gas slump but this is likely to decrease as the oil and gas market picks up again.

Smaller vessel solutions such as Service Operation Vessels (SOVs) are being introduced by UK companies. Recent examples into the market include the Bibby Wavemaster and Wavemaster 2.

Crew transfer vessels (CTVs) have a strong UK presence. Companies such as Windcat, Turbine Transfers, Dalby, and CWind all have great maritime and offshore wind experience. This market is not expected to grow significantly with offshore wind construction moving further from shore, and the companies will have to diversify to meet the requirements of the offshore developers. This leaves the market very competitive to support nearer shore windfarms and could drive the vessels to overseas areas.

Personnel and technician supply to manage and maintain the windfarm is a good example of where the UK performs well. SMC (Specialist Marine Consultants) is a prime example of how small companies can provide excellent expertise to the industry, they can readily provide experienced personnel for deployment for maintenance activities. There are limited barriers to entry in these areas, however a proven track record is often a requirement from developers.

7. Technology roadmap for the sector

The Offshore Wind Innovation Hub is the UK's primary coordination body for innovation, focusing on offshore wind energy cost reduction and maximising UK economic impact. The Hub identifies the innovation priorities across the sector, showcasing the supply chain growth potential and a comprehensive view of the funding opportunities available. In addition, it is the key mechanism for communicating the key focus areas for the sector's requirements for innovative solutions to existing supply chain and potential new market entrants.

The Hub's Technology Roadmaps identify the innovation needs of the offshore wind sector and ways to solve them. They have been built in collaboration with industry and academia

and identify the key challenges and priorities for offshore wind. The roadmaps are focused on 4 key areas within the sector: Turbine, Electrical Infrastructure, Substructures and O&M; identifying technology priorities and tracking progress of innovation areas. Each innovation area is scored on three key criteria: UK benefit, potential to reduce LCoE and case for intervention.

A recent assessment by ORE Catapult identified several Roadmap Innovation Areas with particularly high UK benefit. These examples can be found in Table 1, with a more detailed description in Appendix 13.1.

Table 1: Technology roadmap innovation areas with high UK benefit

Turbines	O&M and Windfarm Lifecycle	Electrical Infrastructure	Substructures
Alternative composites	Machine learning/deep learning from big data	Product Environmental Design	Novel fixed foundations
Blade leading edge erosion solutions	Robotics & autonomous systems	Innovation in design concepts	Floating - achieve cost equivalent of fixed
Magnetic gearing	BVLOS Autonomous Systems	Health Monitoring Development	Total integrated design - fixed & floating
Disruptive acoustic emissions condition monitoring	Site Restorations (Decommissioning)		

8. Opportunity for new UK entrants

With the UK Government committed to supporting a pipeline of UK offshore wind projects over the next decade and the existing fleet, there is considerable opportunity for the supply chain to grow and expand, leveraging the skills and capabilities from adjacent sectors - including the expected growth of floating wind. The offshore wind industry has identified many synergies with other well-established industries in the UK e.g. offshore oil and gas, subsea, automotive and aerospace. Companies already active in adjacent sectors that have solutions applicable to offshore wind could be timely new entrants to the supply chain.

There are a number of organisations and programmes across Scotland and the wider UK to support potential new entrants to the offshore wind sector, these include, but are not limited to;



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9. Barriers to entry

This review explored some of the key barriers faced by companies looking to enter the UK offshore wind market. Evidence was gathered from discussions during the Supply Chain Roadshow Workshops and existing reviews; [Breaking into the Offshore Wind Sector; A Primer for New Market Entrants](#) (ORE Catapult, 2018) and [The UK Offshore Wind Supply Chain: A Review of Opportunities and Barriers](#) (Matthew Chinn, 2014).

9.1 Cost incompatibility

Accepted solutions in other sectors may not necessarily be an economical option in offshore wind. If a new solution can compete or reduce costs compared to current industry practice in offshore wind, then it may begin to look attractive to an operator. If a new solution is significantly more expensive, then there must be other obvious benefits, such as in relation to safety, if potential customers are to be encouraged to consider new entrants.

9.2 Risk profile

The appetite for risk may differ between a large operator and a supply chain innovator. A perception of any increase in risk may act as a barrier to engagement with a wind farm

operator or a Tier 1. Development of credibility based on a solid track record is important in this regard. Chinn highlights the “Catch 22” scenario: “How do you win an order requiring a track record if you are new to the sector, and without an order, how do you attract the necessary investment to develop...”

9.3 Risk allocation

The need to allocate risk better within the sector is crucial to encourage new players and SMEs into the market, with a more considered approach to risk allocation, rather than simply pushing it down the supply chain. This issue was raised and discussed at length during all 6 Supply Chain Roadshows by local companies who were either struggling to enter or gain traction in the sector.

9.4 Innovation fatigue

The size of the workforce tasked with the day-to-day operation of an offshore wind farm may be small. The operation is complex, with many activities having knock-on cost and time implications for other parts of the system. In common with many industries, operational staff are generally incentivised to remain highly-focused on delivery against their longstanding key performance indicators. As such, it may be challenging to convince the teams who would use them of the value of investing time and effort in accommodating unproven services or solutions which may jeopardise their performance or add risk.

9.5 Supplier Selection

A standardised criteria for suppliers looking to win contracts in the UK offshore wind sector is sought after within the supply chain. Certifications such as Achilles and FPAL are generally believed to be unnecessarily expensive, time-consuming and complex, whilst providing little value to the company. An inexpensive industry-accepted approach is needed.

9.6 Funding/Support Landscape

The funding landscape and support initiatives available to UK companies developing technologies, products and/or services for the offshore wind sector can be complex, difficult to navigate and currently very limited. For micro-SMEs and companies with limited resources, the situation can often be more difficult, with many funding bodies requiring a certain percentage of match funds. The lack of dedicated funding for development in the offshore wind sector may threaten to impede technology innovation.

10. Recommendations for Market Conditions

10.1 Accelerate the Migration to Low Carbon Energy

The stimulus to develop the offshore wind supply chain will be enhanced by any clear government policy or measure which demonstrates its commitment to low carbon energy. Government can and should set and announce tougher targets with more aggressive timeframes to accelerate the migration from fossil fuels. The implementation of

environmental taxes on carbon emitting energy generation will demonstrate commitment and amplify the good business and environmental case for offshore wind energy and other renewables.

According to Ofgem, 17% of the consumer cost is currently categorised as “environmental and social obligation costs” and it seems reasonable to allocate a larger proportion of these costs to the energy sources that have a greater environmental impact, reducing the burden on zero emission generation. Consequently, the wholesale price for electricity should reflect the means of generation and its environmental impact thus ensuring that efficient low carbon generation (such as offshore wind) is always subsidy free. This important shift in the taxing of pollution will reinforce to industry and the consumer that low carbon electrical generation is socially and economically appropriate.

With an appropriate allocation of environmental costs, the offshore wind energy sector is capable going forward of providing electricity to the consumer without subsidy and this is an important message in gaining everyone’s acceptance of the technology.

Recommendations

- ***Government should announce more ambitious targets to migrate from fossil fuels and tax carbon emission.***

10.2 Encourage consumers to choose low carbon energy sources

Whilst the migration towards low carbon energy will be accelerated by the “push” of government policy and commitment, it would also be worthwhile to enhance the “pull” of the consumers. Consumer demand would inevitably result from a clearer communication strategy and encouragement from the domestic utility providers. Currently the majority of the “Big Six” utility providers (circa 80% of the market) do not offer consumers a low carbon tariff and this is left to niche providers who typically purchase REGO certificates and provide energy to a relatively small proportion of households. An increase in the demand for REGO certificates from consumers will stimulate further demand for low carbon sources.

It might be time to re-categorise energy production as the term “renewable” may not be as relevant today as when it was conceived. Historically the primary concern regarding energy supply focussed on the potential exhaustion of finite fossil fuel supplies and the proposed migration towards renewable fuels which included zero emission, carbon-emitting biomass and nuclear. Changing environmental priorities and consumer preference mean that the depletion of fossil fuel reserves is no longer a dominant concern.

If it is now accepted that energy generation should migrate towards zero emission (wind, solar, hydro, tidal and nuclear) and away from carbon emitting (coal, gas, oil and biomass), it might now be appropriate to move away from the term renewable as either a confusing or unattractive goal.

Whilst energy companies are required to tell their customers about the mix of fuels, they use to generate the electricity (Government's Electricity Fuel Mix Disclosure Regulations 2005), there is little evidence that this information is clearly communicated.

Recommendations

- ***Government/Ofgem should ensure that consumers have visibility and choice of low carbon generated electricity in the retail market to stimulate the market for greater low carbon electricity generation.***
- ***Domestic energy providers are required with each bill, and on their home page, to clearly advertise the mix of electricity production between zero emission and carbon emitting sources.***

10.3. Encourage households to store, use or re-sell electricity

Most renewable energy generation technologies deliver a variable supply which is not necessarily in sync with demand. Whilst the development of offshore turbines has reduced variability, it is still an issue that ultimately limits the extent to which renewable generation can be matched to consumer demand. Inevitably therefore the national network requires some storage capacity to help smooth the dynamic differences between generation and demand. This is in addition to the growing importance of demand side management solutions.

Centralised and substantial battery systems within the national grid have been considered, however it seems inevitable that households throughout the country will increasingly own domestic battery systems and electric vehicles which can provide a highly distributed battery storage capability.

Increasing the dynamic pricing of electrical energy will encourage households to store electrical energy within household and vehicle batteries and potentially sell it back during periods of either high demand or low generation.

It is feared that the current generation of smart meters may not be "smart enough" although we understand that half hour pricing is coming for consumers and further proposals for "time of use" tariffs will support the roll-out of smart meters and greatly facilitate the "smoothing" of consumer demand and improve the ability of the grid to match supply and demand.

The infrastructure of the National Grid could currently accept 32.6GW of offshore energy and therefore beyond this it will presumably require further investment to ensure that it is capable of meeting the increasing demands of consumers and industry and facilitate the transition towards agile pricing and consumption.

Recommendation is for government to ensure centralised and substantial battery systems and alternative storage technology are realised so that offshore wind can be better matched to consumer demand.

Recommendations

- ***Accelerate the migration of “time of use” tariffs, smart meters and encourage consumers to “sell-back” at peak times.***

11. Recommendations for Offshore Wind Sector (Industry & Government)

At the time of writing this report the Offshore Wind sector deal had not been concluded or published and is assumed that several of the recommendations made within this report will be consistent with those arrangements.

The following recommendations follow from a brief analysis of the sector and in particular listening to as many existing or aspiring offshore wind suppliers as we were able to connect with, primarily through the supply chain roadshow.

The recommendations are intended to be as comprehensive as the short study allows and it is acknowledged that most of the proposals have come from within the industry and many are already being pursued. We have not sought to prioritise recommendations or seek to understand the extent to which they might already be addressed.

11.1 Enhance Communication of the potential and Achievements of Offshore Wind Energy

Offshore wind energy has already demonstrated that it is the most cost competitive source of low carbon electrical energy available to the UK. Furthermore, we are confident that offshore wind can provide over 50% of the UK demand for electrical energy. The sector will continue to demonstrate the reliable and sustainability of the technology and it's inevitable that the cost of producing electrical energy will only continue to fall as the sector matures and the volume increases.

The sector needs to better communicate its substantial achievements and potential to government and its agencies, media, industry, public and its consumers. The message that offshore wind is the only scalable low carbon, reliable and potentially non-subsidised sector; capable of providing over half of the UK's electrical demand, has not been accepted and absorbed by the majority.

Recommendations

- ***Clear emphasis should be placed on communicating achievements of the sector to; government, media, public and wider industries, to progressively erode any misplaced perception that offshore wind is niche, unproven and heavily subsidised.***

11.2. Steady Requirement Stream from Government

The investment in offshore wind technology, infrastructure and wind farms is a long term and substantial commitment for any business. In order to encourage the necessary investment and prioritisation within the supply chain, the government must continue to demonstrate a substantial, ambitious, long-term and rolling commitment.

Now that the offshore sector has demonstrated that it is the cheapest low carbon route for large scale electrical generation in the UK, it would seem appropriate to set-out a long-term strategy to adopt offshore wind energy as the majority provider for UK requirements.

The following percentage targets for the offshore proportion of the total UK electricity supply would appear to be both appropriate and achievable; 2020 – 10%, 2030 – 35%, 2050 – 50%.

In order to achieve these ambitious targets, government should maintain pressure on the sector to bring down costs and increase UK technology and content but make a clear commitment to regular two-yearly offshore wind auctions through to at least 2030, with a steady build rate of greater than 2GW/annum.

Recommendations

- ***Government should announce clear targets for offshore wind and commit to two-yearly CfD auctions through the next 20 years of greater than 2GW/annum to be procured and constructed***
- ***The Crown Estate and Crown Estate Scotland should provide a pipeline of projects to be entering the agreement for lease to support at least 2GW/annum deployment through the next 20 years***

11.3. Encourage UK Content and Technology

The offshore wind sector in the UK would not have achieved the substantial development of capacity and cost efficiency without substantial foreign technology and capability. Until now the UK has lacked a clear, long-term strategic plan for the deployment of offshore wind energy, therefore the relatively short-term “ad-hoc “commitments made to date, have not been sufficient to develop substantial UK technology and capability. Consequently, the sector has been reliant upon overseas developers as earlier adopters of this technology who are able to commit to deployment without a long-term government plan.

Fortunately, several continental Tier 1 offshore wind suppliers have been encouraged to build significant manufacturing plants within the UK to serve their largest market. These plants have created good quality manufacturing jobs within the UK.

The development of the substantial UK offshore wind capacity has allowed the overall supply chain to acquire substantial knowledge and know-how, although understandably this has largely been retained within the foreign businesses which have led the process.

Consequently, UK business has so far missed the opportunity to develop the key intellectual property and system integration knowledge required to lead and capitalise upon the substantial export opportunities which will follow as offshore wind energy becomes more actively adopted throughout the world.

The industry is close to achieving its ambition set in 2013 of 50% UK content over the life of the windfarm project. This is an extremely good stimulus, encouraging developers to actively consider UK businesses. It is important however, to ensure that the measurement of UK content isn't based purely upon the headline cost without analysis of the upstream origin. The UK content should be based upon the value-add in this country.

Ultimately, however, the ability of the UK and its offshore wind energy supply chain to fully participate in the rapidly developing export market will largely be dependent upon owning the appropriate intellectual property and system integration knowledge. I would recommend therefore that there is a requirement within future supply plans to demonstrate that 10% of the total capital cost should incorporate intellectual property developed and owned by companies incorporated in the United Kingdom. The inclusion of a UK intellectual property content target would serve to pull new businesses into the sector and more importantly ensure that UK businesses develop knowledge and capability that will lead to potential export opportunities.

Recommendations

- ***Government should assess developer Supply Chain Plans expecting developers to achieve 60% of life cycle cost to be UK sourced by 2030 and to demonstrate that 10% of the total capital cost should incorporate intellectual property developed and owned by UK companies.***

11.4. Focussed R&D Funding from Government

In order to accelerate the development of UK intellectual property within the strategically important offshore sector, the government should allocate funding to support appropriate R&D investment.

Whilst there is some government support is available, SME's find the pursuit of it complex, confusing and repetitive. To many SME's the various sources are bewildering, and it would be beneficial to simplify the route to funding and if there are more than one source it would be good if a single application could be multi-routed. Another challenge includes the UK grant funding requirement that R&D project participants be full collaborators funding their own development costs and typically receiving less than 50% of the agreed costs back from UK funding bodies. This contrasts with projects self-funded by OEMs or larger supply chain companies, which would typically see participating SME's being paid for all of their agreed costs.

If the offshore wind sector can agree a technology roadmap and development plan, UK businesses could submit investment proposals which are aligned with the industrial strategy and seek R&D investment matching from government. Potential criteria to gain

government funding could be based on the sector's innovation priorities identified via the Offshore Wind Innovation Hub and upon the following;

- Reduce the cost of offshore electricity generation
- Enhance the efficiency of offshore turbine systems
- Extend the working life of systems or components
- Reduce the cost of operation and maintenance
- Increase the efficiency of electrical distribution
- Achieve UK employment and/or IP to support export opportunity
- Reduce the potential intermittency of systems
- Demonstrate a circular economy e.g. recycling/repurposing/refurbishing
- Enhance health and safety

Additional grant funding should be made available to new entrants proposing solutions based on experience from other industries, and those that support a circular economy. This will stimulate interest from other industries to consider if their own innovative solutions can be adapted to the offshore wind sector in return for additional funding.

Government should consider ways to support R & D and innovation for SME's that goes beyond financial support. These could come in the form of follow up with companies that successfully receive funding to evaluate the outcome of the work and provide support so that they can effectively engage with the market. The Offshore Wind Industry Council should support this follow up by providing industry expertise to advise companies receiving funding on the best route to market for their solutions.

Recommendations

- ***Government should provide focussed development funds which assist UK businesses to generate additional UK IP by innovating and providing relevant and competitive technology to the sector. Access to such funds should be determined by clear industry-set objectives and the process of application should be as simple as possible. The innovation funding budget should be front-loaded and reflect increasing deployment.***
- ***Government should review rules relating to R&D grant funded project participants and collaborators. The purpose of the review should be to see whether a tweak to the rules could drive a greater number of additional innovation projects and associated UK IP development being proposed by SMEs, as well as their customers (OEMs & larger supply chain companies).***
- ***The Offshore Wind Innovation Hub should be further developed to improve accessibility to the Technology Roadmaps and build on the success of the Innovation Challenge programme. Developers and OEMs should better communicate their innovation priorities via the roadmaps as they occur and use this platform to run "Innovation Challenges". This will help to identify the areas where R&D funds should be allocated and encourage new market solutions from other sectors.***

11.5 Wind Farm developers to share operational data and modelling.

The planning, design and operation of turbine arrays is currently independently modelled and analysed by individual developers. Any mechanisms and inducement that encourages developer/operators to cooperate and share the highest-level model predictions and performance data, could enhance the efficiency of the overall UK offshore wind system. Information shared centrally could allow an island wide wind generation model to be created and used to encourage learning between sites and allow more accurate prediction modelling to plan future deployments around the UK.

Currently developers and tier 1 suppliers develop their own infrastructure for data logging, condition monitoring, analysis and control. Every turbine and array gathers considerable data which extends the knowledge of those who hold the information. Consequently, the overall UK offshore system is not gaining from data gathered within the various arrays.

The wind around the UK seas is a national resource and open data infrastructure would; accelerate learning, avoid the duplication of development of systems, spread knowledge across a broader supply base.

Recommendations

- ***Whilst developers already share limited data through projects such as SPARTA, industry should develop and share a nationwide offshore wind operational database, with models to improve efficiency and facilitate a broader understanding for future developments.***
- ***Turbine data from a sample of older machines within operational offshore wind farms could be made available to UK companies looking to develop and deliver innovative O&M technologies.***

11.6. Encourage new UK Developers

The offshore wind energy business has now matured within the UK market, the technology has been proven, there are people and organisations who understand the sector and there are proven financial returns. Offshore wind still represents a substantial and long-term investment and so potential investors/developers probably still require confidence in the commitment of the government and stability of wholesale pricing.

Recommendations

- ***Government should demonstrate commitment to a “pipeline” that will encourage new developers into a maturing sector.***

11.7 Encourage Tier 1 entrants

The sector is fortunate to have several highly competent foreign developers and Tier 1 suppliers, without whom the substantial achievements of the sector would not have been

achieved. Whilst considerable knowledge and skill has been developed within the existing developer/ Tier 1 community, the sector is still relatively young, and the early volumes have required relatively high-skilled, labour-intensive manufacturing. It seems likely that future volumes, particularly if the export opportunity is realised, will encourage more advanced materials and manufacturing processes. This would seem to potentially provide an opportunity for new industrial entrants.

The Industry Prospectus generated and circulated during this supply chain review was designed to encourage all sizes of UK technology businesses to consider the opportunities that are arising within the offshore wind energy sector. Government and its agencies should continue to promote these opportunities and encourage the development of a UK Developer and Tier 1 entrants. This would provide a tremendous stimulus to the development of UK intellectual property and the local supply chain.

Recommendations

- ***Government should actively encourage UK technology businesses within FTSE250 to invest in offshore wind technology and create more good quality employment and export potential.***

11.8 Development of exports from Tier 2 & 3 suppliers

The export of “big parts” in the offshore wind sector will always be difficult, so UK business should concentrate on the export of technology, knowledge and intellectual property.

During this supply chain review it was encouraging to meet various small technology businesses that had successfully achieved significant market share for their products throughout the worldwide wind energy sector. However, many SME’s lack the knowledge to promote and sell their products and services to export markets.

Based on the feedback during and after the Supply Chain Roadshows it is clear many UK SME’s feel that most of the export market opportunities are blocked to them as a result of local protectionism and consequently, they lament the lack of similar in their own market. Their frustrations are entirely understandable, and it is of course difficult to overcome either declared or more subtle local content bidding rules. These businesses don’t have the knowledge or network to establish “local partnerships” or the scale to create foreign subsidiaries. Government or industry agencies could establish “bidding teams” to bring together SME’s to provide guidance and practical measures to satisfy local content requirements.

The “bidding teams” can in turn bring benefit to a potential UK-based Tier 0s if they were to come to the market. For example, if a UK-based Tier 0 that is already active in the UK wishes to expand their portfolio in global markets then access to these “bidding teams” could provide a route to satisfying local content requirements in that market. The local content requirements would be satisfied if a successful “bidding team” has already partnered with a company in the new market. This can have the added benefit of involving Tier 2 and Tier 3 supply chain in early stages of lifecycle planning

Recommendations

- ***Developers and their supply chain should be required to demonstrate clear and tangible commitment to the support of innovative SME's.***
- ***The Department for International Trade (DIT) should be adequately resourced to be more active in highlighting and supporting the UK export opportunity and associated barriers. Their role in supporting SME's to find routes to market for exporting needs to be better communicated.***
- ***Greater clarity and consistency on the availability of grants to support SMEs on delegations is required.***

11.9 Seek to Reduce “cost of bidding” for Tier 2 & 3 Suppliers

SME's wishing to supply to the offshore wind energy sector are often faced with the challenge of providing “Performance and Warranty Bonds” along with Professional Indemnity Insurance. Not only is this a complex and daunting process, but for small businesses it can be cost prohibitive. Whilst it is understandable that the bigger players wish to mitigate their own risks, it's likely that by seeking to pass the risk or the cost associated down through the supply chain, it either deters smaller suppliers and increases the overall programme cost. Perhaps the industry can collectively engage with finance sources and the insurance sector to find innovative solutions that can work for all levels within the supply chain, making it easier for small businesses to operate within the sector and reduce the overall cost of supply. It is understood that an example of such support has already been provided by the ‘Catalyst Fund’ supported by Tees Valley. Models such as this should be explored by government and OWIC.

Furthermore, the SME's are often required to respond to several bidding developers during each auction with the same or similar information, perhaps this process be centralised and simplified.

Considerable capability that has previously been developed within other UK industrial sectors could be brought to the offshore wind industry and we must find way to encourage this transfer of skills and intellectual property.

Recommendations

- ***The sector and government should work together and offer SME's support to satisfy bid and entry requirements in a simple and cost-efficient manner. Developers and Tier 1 companies should clearly announce how the supply chain can participate in their bids.***

11.10 Encourage Sector Clusters throughout the UK

Business and industry in many sectors have often flourished in geographical concentrations, where companies, academia, training establishments and supply chain infrastructure has

come together to achieve synergy and enhance innovation, growth and competitiveness. The Aura offshore wind cluster around the Humber has already demonstrated the acceleration of capability and interest that can be achieved by a local focus and concentration of activity.

The OWIC Clusters working group will publish its own recommendations and “play book” to encourage Offshore Wind Energy industrial clusters throughout the UK. It has already been demonstrated in many other industrial sectors that the concentration of SME’s in tight geographical locations encourages networking, synergies and the development of skills and business. Whilst ultimately the development of successful industrial clusters relies upon an organic process, it is extremely beneficial to encourage their early development with local industry and LEP support.

Recommendations

- ***Use successful cluster case studies from other sectors and the Humber Aura example to encourage further offshore wind clusters around the UK and ensure there are mechanisms in place to drive collaboration between clusters.***

11.11 Encourage developers and Tier 1 to invest in innovation

The current CfD auction process appears to place primary importance on the cost of electricity, which encourages developers and Tier 1 suppliers to be overly conscious of risk in their purchasing and development decisions. If all bidders were required to include and demonstrate investment in technical development, innovation and the enlargement of the supply chain; the playing field remains level and there is scope to accept some risk in the project and take the technology and knowledge forward.

Potentially within each bid it might be possible to determine an appropriate level of funding, linked to capacity of the project, which is dedicated to demonstration of innovative technology. If all bidders are obliged to demonstrate this commitment to advancing the efficiency of offshore systems, the playing field remains level whilst encouraging technical advancement.

Recommendations

- ***Requirement for all developer bids/ Supply Chain Plans to demonstrate how the project will more deliver technical development opportunities.***

11.12 Require enhanced supply chain engagement

SME’s consistently informed us that it was difficult to engage with and find the appropriate route into the developers and tier 1 suppliers that dominate the UK offshore wind energy sector. The current offshore wind supply chain is polarised with a few very large enterprises and many aspiring SME’s, without many medium to large sub-system providers which might otherwise form a potential entry point for the smaller businesses.

Whilst it is clear that developers and tier 1 want to engage, and ultimately the onus should be on SME's to be persistent and tenacious, it might be beneficial to require Supply Chain Plans to demonstrate how they will improve their engagement with existing and potentially new supply chain innovators.

SME's reported that it is difficult to engage with the developers and Tier 1 suppliers who operate on much longer timescales; they felt that much of the information they could access was very generic and therefore didn't really aid focussed market penetration. Furthermore, the developer/operators understandably did not wish to consider changes to equipment or operating specifications during the warranty period of new systems.

Developers typically enter into agreements with Tier 1 suppliers after consent and planning has been concluded and during the initial warranty period the opportunity for SME innovators is limited. It would be beneficial if SME's could better understand the overall project lifecycle and better appreciate when projects move into a more fruitful phase of continuous improvement/incremental gains.

The supply chain wishes to engage earlier in the overall project cycle and receive a better appreciation of the full lifecycle plan and receive greater transparency around project IP.

Recommendations

- ***Require all developers to publish clear, consistent life cycle procurement plans allowing the supply chain to understand the potential requirements of the project and likely timeframe of opportunities. A central repository for all this information is highly sought after.***
- ***Better promotion of supply chain opportunities and events within the sector via the relevant trade associations i.e. RenewableUK and Scottish Renewables. Clearer visibility of these opportunities for potential new market entrants is required within these online platforms e.g. "Are you new to the sector? Click here for more information"***
- ***More events dedicated to offshore wind O&M, e.g. "O&M Technology Challenge Event" and "Meet the O&M Buyer" would highlight and build on the existing UK capabilities in offshore wind O&M, and potentially identify export opportunities.***

11.13 Introduce more sector standards

The development of more standardised processes and procedures across the UK offshore wind sector would make it easier for the supply chain and particularly new entrants to engage efficiently in multiple projects. The development of these standards might also initiate the adoption of UK standards across the broader market and facilitate export initiatives.

Elements of standardisation should be carefully selected so as not to inhibit future development in areas which increase efficiency or potentially reduce costs. Perhaps generic designs for jackets and foundations could be considered.

Industry wide safety standards and operational procedures whilst operating at sea would seem sensible. Component and system qualification standards would potentially assist the supply chain and reduce the costs of entry for suppliers.

Recommendations

- ***Industry should create a working group to formulate, approve and publish standards. More effort to standardize and simplify the contracting process within the sector is needed.***

11.14 Support for Ports and Infrastructure Development

There is a challenge for UK ports to be selected for manufacturing contracts when their facilities are modest in size and capability compared to fiercely competitive facilities such as Vlissingen and other state-supported European ports. This is particularly relevant with the increasing scale of structures, vessels, blades and associated installation equipment. If the UK is to remain competitive in the manufacturing market, there appears to be a strong case for more government support for UK ports and infrastructure to strengthen their competitiveness.

Such support should take into consideration the infrastructure required for UK Ports to successfully support manufacturing, construction and marshalling services including transport to and from site and accessibility.

Recommendations

- ***UK Government should re-introduce a “port & infrastructure funding scheme” of circa £100million for the purpose of creating UK facilities that can competitively compete with state funded facilities in Europe.***

11.15 Development of training and skills

Support for the appropriate training and skills development to support the growth of the supply chain is essential. The sector is beginning to quantify the scale of employment that will result from the ambitious growth of offshore wind energy capacity and it would now be a good time to analyse and publish the expected skill mix required for this growth. This would form the basis for a more active engagement with training and education establishments.

As a new and developing industrial sector the offshore wind industry should now more actively engage with universities and technical colleges to encourage an alignment with the requirements of the industry and stimulate students to consider the sector for their future careers.

Recommendations

- ***Industry should develop a skills and people requirements plan and collectively engage with academia and training bodies to develop the plans to provide the appropriate skills.***

11.16. Improve the representation of SME's in policy forums

The sector is currently dominated by a small number of large developers and Tier 1 companies. The large players appear to be working well together, but there is clearly a feeling within the SME community that they currently lack a strong voice. Whilst RenewableUK is providing a diligent service to its 400-member companies and its database information is incredibly valuable for many, an SME elected by others as their representative on OWIC might provide a useful input and two-way communication channel and demonstrate the sectors commitment to these businesses within its supply chain.

Recommendation

- ***SME's should be invited to propose and vote for two representatives to represent their interests on OWIC on a rotational basis.***

12. Acknowledgements

The UK Offshore Wind Industry: Supply Chain Review has been prepared by:

- Claire Canning, Project Development Manager, ORE Catapult
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- Thomas Ellson, Triton Knoll, Innogy
- Mary Thorogood, UK Stakeholder Lead, Business Development, MHI Vestas
- Kasper Bundgard Sorensen, MHI Vestas
- Martin Whitmarsh

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Special thanks to the trade associations, member organisations and Catapults who supported this work by promoting the Offshore Wind Industry Prospectus and Supply Chain Roadshows to their members and company networks.

13. Appendices

13.1 Technology Roadmap Areas with High UK Benefit

Turbines

- **Alternative Composites**
 - Alternative fibres or materials that are better in terms of costs, tensile strength, light weighting, easiness to manufacture, environmental emissions or improved environmental performance.
 - Potential cost reduction from this element are material cost or damage resistance that would decrease maintenance cost.

- **Blade Leading Edge Erosion Solutions**
 - Leading Edge Erosion is known to occur when precipitation in the atmosphere and other airborne particulates impinge on wind turbine blades rotating at high velocities.
 - When the smoothness of a blade surface is degraded its aerodynamic performance is known to reduce; this restricts power and revenue generation.
 - LEE increases surface roughness at the outer section of the blade, where the majority of lift, and hence power, is generated.
 - LEE can expose the blade materials to damaging levels of UV light exposure and moisture ingress, which can reduce structural integrity.
 - Developing coating that protect blade LE from rain/sand erosion for blade lifetime and allow higher tip-speed would be highly beneficial to extend blades lifetime.
 - Current solutions are based on tape and coating solutions, which can last for 1-16yrs with limiting at 85m/s. Research needs cooperation between Industry and RTO.

- **Magnetic Gearing**
 - Use of magnetic and hence non-contact torque-speed converter alternatives to mechanical gearboxes.
 - Magnetic gearing fundamentally doesn't need to use oil-based lubrication because no metal to metal contact is required to transmit the energy from rotor to generator.
 - So, if this technology can prove efficiency and reliability with competitive cost, it can be disruptive innovation to increase the reliability of floating wind and decrease the LCOE.

- **Disruptive Acoustic Emissions Condition Monitoring Analysis**
 - Maximise operational performance from existing wind farms

- AE monitoring could detect incipient failures far more effectively than vibration methods which are currently commonplace in the offshore wind industry.

O&M and Windfarm Lifecycle

- **Machine Learning/deep learning from big data**
 - Machine learning and drawing benefit from disparate data sources promises both benefits to optimisation of control and operation strategies towards optimal O&M intervention.
 - Also provides a better understanding of design and modelling assumptions which should lead to improved design of future structures and machines.
 - Issues to be addressed include the integration of numerical models with sensor data to interpolate within individual machines and across arrays, sensor reliability and algorithm and parameter characterisation.
 - A challenge will always be the confidence in which results can be relied upon and so verification and validation cases/methods will be critical.
- **Robotics & autonomous systems to total replacement of human working - demonstration**
 - The displacement of humans from repetitive and/or high-risk tasks by deployment of entirely autonomous robotic systems.
 - Example repetitive bolt check or inspection tasks, where a human operator is only informed in event of an anomaly or event requiring their attention.
- **BVLOS Autonomous Systems**
 - Beyond Visual Line of Sight autonomous systems.
 - Example is a blade inspection drone where the pilot does not need to be able to see the vehicle at all times.
 - This has significant technical challenges but would enable much more efficient use of drones by avoiding the limitation of getting people to within relatively close distance to turbines.
- **Site Restoration (Decommissioning)**
 - If a windfarm at end-of-use will not be repowered, then the complete site needs to be decommissioned and the site restored to its “natural” state.
 - Assessments need to be carried out to analyse impacts of decommissioning scenarios on the established ecosystems on the windfarm e.g. the extent to which substructures and cables in the seabed will be removed.
 - Studies should be undertaken early on, especially with regard to ground conditions both technical (e.g. the amount of overburden to be removed) and ecological (e.g. assessing what the pre-installation ecology is, so that one has a baseline for a ‘return to natural state’).
 - The benefits of site restoration, such as the economic and functional value of recovered materials, restored environment must be compared to the costs, such as damage to newly established flora and fauna on the windfarm.

Electrical Infrastructure

- **Product Environmental Design**
 - Resource security is a growing issue for low-carbon infrastructures that depend on a combination of raw materials (rare earth metals, lithium, cobalt), copper and aluminium.
 - All components and materials in a turbine should be designed for durability, recycling and disassembly.
 - A balance must be found between cost, durability, extending the lifetime of components and the ability to recover materials at end-of-use.
- **Innovation in design concepts**
 - Large arrays of far-from-coast wind farms (and also tidal and wave harvesters) might lead to different optimal design concepts than those adopted so far.
- **Health Monitoring Development**
 - Integration of electrical infrastructure component condition-based health monitoring (CBHM) into a single intelligent platform.
 - Development of new solutions. Relatively new area, with big SMEs opportunities.

Substructures

- **Novel fixed foundations**
 - Current designs for fixed foundations focus on monopile or jacket design concepts.
 - While these are expected to continue to dominate fixed foundations there is space for novel, cost saving designs to still be developed.
- **Floating – achieve cost equivalent of fixed**
 - Currently floating wind is multiple times more expensive than bottom-fixed offshore wind.
 - If floating offshore wind is to become a mainstream technology, it needs to experience a significant cost reduction that would make it cost comparable to bottom-fixed offshore wind.
- **Total integrated design- Fixed & Floating (substructure coupled with turbine)**
 - Offshore wind turbines (fixed or floating) are coupled systems, however to date these have often been designed as two independent systems (a foundation and a wind turbine).
 - This has resulted in suboptimal designs of foundations.
 - A more open relationship between foundation designers and wind turbine OEMs can improve foundation designs, ultimately lowering the LCOE of offshore wind.

13.2 Circulation of the Offshore Wind Industry Prospectus and Roadshow Invitations

The Offshore Wind Industry Prospectus (Appendix 13.3) and follow up Supply Chain Roadshow invitations were circulated to approximately 5,000 companies. The target recipients represented a mix of large and small enterprises; including companies either already active within the offshore wind supply chain, or active in adjacent sectors with an interest in breaking into the offshore wind market. The majority of recipients were approached electronically via the following organisations and networks:

- RenewableUK
- Scottish Renewables
- ORE Catapult
- High Value Manufacturing Catapult (All Centres)
- Satellite Applications Catapult
- Scottish Enterprise
- Highlands and Islands Enterprise
- Scottish Engineering
- The National Subsea Research Initiative (NSRI)
- The Energy Industries Council (EIC)
- The LEP Network (38 LEPs)

Individual hard copies were issued to over 20 companies active in the FTSE 250 and renewable energy suppliers.

13.3 The Offshore Wind Industry Prospectus

OFFSHORE WIND INDUSTRY PROSPECTUS

OCTOBER 2018



**THE UK HAS OVER
1800 TURBINES
PROVIDING 7.2GW
CAPACITY, POWERING
APPROXIMATELY
6.5 MILLION HOMES
AND 6.2% OF UK
ELECTRICITY IN 2017**

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ABOUT THIS PROSPECTUS

This prospectus has been prepared by ORE Catapult and the Whitmarsh Supply Chain Review Team on behalf of the Offshore Wind Industry Council (OWIC).

Special thanks to Scottish Power Renewables, Innogy, MHI Vestas and Siemens Gamesa Renewable Energy.



INTRODUCTION



MARTIN WHITMARSH

Former CEO of McLaren Group and F1 Team Principal

I am delighted to have been appointed by the Offshore Wind Industry Council to lead a review of the UK offshore wind supply chain. This review aims to identify opportunities for UK firms to win a greater share of the growing domestic and global offshore wind market.

Although I'm new to offshore wind, I see similarities with the automotive sector where over 25 years, I witnessed the development of a world leading motorsport industry which I believe created the catalyst for the renaissance of automotive development and manufacture in the UK. It's fascinating to see the maturing of offshore wind energy as a new industrial sector and to understand the huge future business potential in and beyond our waters. The need for this technology is obvious and to recognise the progress that has already been made in demonstrating its practical and economic viability is very exciting. I was therefore delighted to become involved and hopefully bring some of the tremendous opportunities to the attention of existing and new British businesses.

You may not know it, but offshore wind energy is a major UK success story. With Government support and world leading business expertise, the UK now has the largest offshore wind generation capacity in the world and the sector is currently the UK's 4th largest infrastructure building program. Offshore wind is on course to generate 10% of the UK's electricity by 2020 and the industry has a target of generating over a third of the UK's electricity requirements by 2030 and over half by 2050 as the UK moves away from fossil fuels and towards a more electric future. Offshore wind technology has now demonstrated that it is cost-effective and is now part of the mainstream.

The United Kingdom should now be building upon its world

leadership in deployment of offshore wind energy to exploit the substantial export opportunity. Markets around the world are developing offshore wind as the world moves away from fossil fuels towards a cleaner future of decarbonised power, heating and transport. If the UK is to take advantage of the growing worldwide opportunity it is imperative that business now develop and own the intellectual property to do so.

The development of the world's first floating wind farm at Peterhead off the north-east coast of Scotland demonstrates the leadership of the British Offshore Wind Sector, but also opens the possibility of technology not previously considered suitable for offshore wind energy. This is creating opportunities for smart UK businesses to develop their offshore wind expertise and access a growing global market. Industry expects a fivefold increase in UK exports to £2.6bn per year, and it has been estimated that a further £55 billion will be invested in offshore wind energy by 2030.

I see the opportunity for UK businesses to enter or expand their commitment to the rapidly growing offshore wind sector as exciting and substantial. We have in so many fields demonstrated the ability to innovate and respond to new challenges. It's clear that the offshore wind sector can benefit from knowledge and learning in other sectors. These opportunities won't only be for 'traditional' offshore wind suppliers involved with components like turbines, foundations, boats and cables, but also in manufacturing techniques, robotics, drones, sensors and big data to name just a few.

SUPPORT FROM UK GOVERNMENT

CLAIRE PERRY STATEMENT

The UK is leading the transition to a low-carbon economy. In doing so we want to maximise the advantages for UK industry from this transition and to ensure we benefit from the innovation and investment that will be required to meet our climate ambitions. As part of this the UK has helped to realise an extraordinary coming of age for the global Offshore Wind sector, and is poised to reap the reward in new export markets, alongside building on our successes at home.

The Government recently announced a new wave of support for the offshore wind sector, committing to an additional 1-2GW of offshore wind per year in the 2020s. The UK supply chain is strong and will continue to expand to service this demand, but I believe there is much more we can do to ensure this Government's commitment to offshore wind translates into a comprehensive industrial success story. I want to see the UK supply chain increase its global competitiveness by building on areas of strength, capitalising on our world-leading research base to drive innovation, creating new British manufacturing capability and attracting new supply chain players to the UK - while continuing to drive down costs. I hope Martin's experience from other sectors can help the offshore wind sector understand what it can do to meet these new opportunities and build on historic levels of investment in growing the UK supply chain, creating high value jobs across the country. I look forward to seeing how the sector responds to his findings.

Yours sincerely,

The RT Hon Claire Perry MP

Minister of State for Energy and Clean Growth

THE UK NOW HAS THE LARGEST OFFSHORE WIND GENERATION CAPACITY IN THE WORLD

CROSS SECTOR OPPORTUNITIES



£2.5 TRILLION INVESTMENT IN WIND ENERGY BY 2040

OFFSHORE WIND IS THE CHEAPEST LOW CARBON ROUTE FOR LARGE SCALE DEPLOYMENT IN THE UK



THE COST OF ELECTRICITY GENERATED FROM NEW OFFSHORE WIND PROJECTS HAS **FALLEN BY 50%**



OPPORTUNITIES FOR INNOVATION

OFFSHORE WIND GLOBAL MARKET IS RAPIDLY EXPANDING



1 OFFSHORE WIND - THE STORY SO FAR

Energy policy must address three major challenges; climate change, security of supply and affordability. Offshore wind provides solutions to these with low carbon, regionally independent and low-cost electricity generation. The sector is developing rapidly with a pipeline of new projects, strong investment and a fast-growing supply chain. It is a sector that is full of opportunity and now is the perfect time to get involved.

The UK has the largest installed capacity of offshore wind in the world thanks to a supportive regulatory and policy framework; in early August 2018 there were 1,837 turbines installed in UK waters with a total generating capacity of 7.2GW, enough to power over 6 million homes. This provides a strong knowledge base to enable UK companies in the offshore wind sector to thrive as world leaders in a high growth global market. The reality has changed from the question “How can we afford to mitigate climate change with offshore wind?” to “How can we afford not to?”.

This prospectus provides an overview of the offshore wind sector, highlights the scale of the opportunity and provides some guidance on how to get involved.

1.1 GLOBAL DEMAND FOR LOW CARBON ELECTRICITY

The Paris Agreement in 2015 bound 195 countries, representing 90% of global economic activity, in a deal to limit the risk and impacts of climate change. It is estimated that over £10 trillion of public and private investment in the global energy sector alone will be required by 2030 for signatories to meet their targets.

The drive to reduce carbon emissions requires a transition to low carbon electricity generation. The demand for low carbon electricity will be strengthened as other sectors such as transport and heat are increasingly electrified. Deployment of renewable energy generation is a key part of the solution with wind and solar power providing the largest contribution. Investment in wind power generation is forecast to be over £2.5 trillion between 2017 and 2040 according to Bloomberg New Energy Finance.

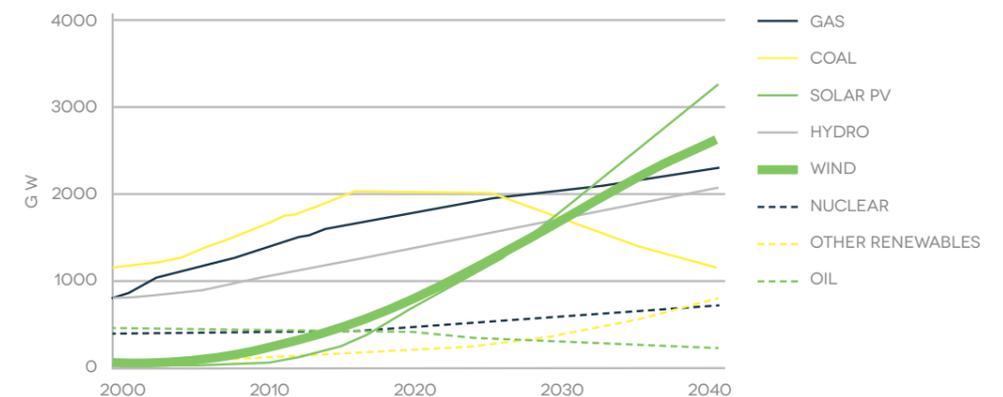


Figure 3: Forecast installed electricity generation IEA World Energy Outlook 2017

1.2 OFFSHORE WIND COST REDUCTION

One of the main drivers for the forecast growth of offshore wind is the rapid reduction in costs. In the UK's Contract for Difference (CfD) process, offshore wind developers bid for a guaranteed price with government funding the difference between the bid price and the wholesale price of electricity. The 2017 CfD auctions saw a 50% strike price reduction over the previous 2015 auction round with a winning project at £57.50/MWh. The German and Dutch markets have both approved subsidy free projects.

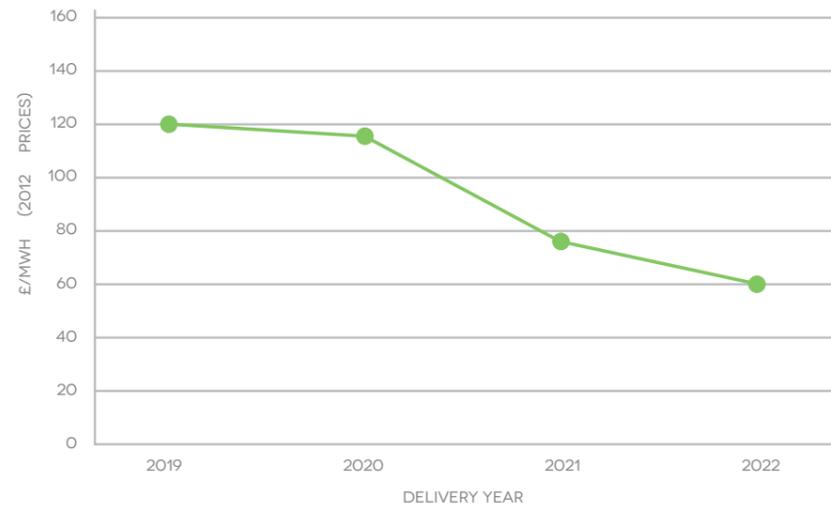


Figure 1: Offshore wind cost reduction in auction rounds.

The cost of offshore wind in the latest auction rounds is approaching £50/MWh. This is significantly less than the 2025 cost forecasts for nuclear and less than new build gas generating plant. Even when the additional costs of intermittency are included, renewable energy from offshore wind, onshore wind and solar photovoltaic is now the cheapest way for the UK to meet its carbon reduction commitments.

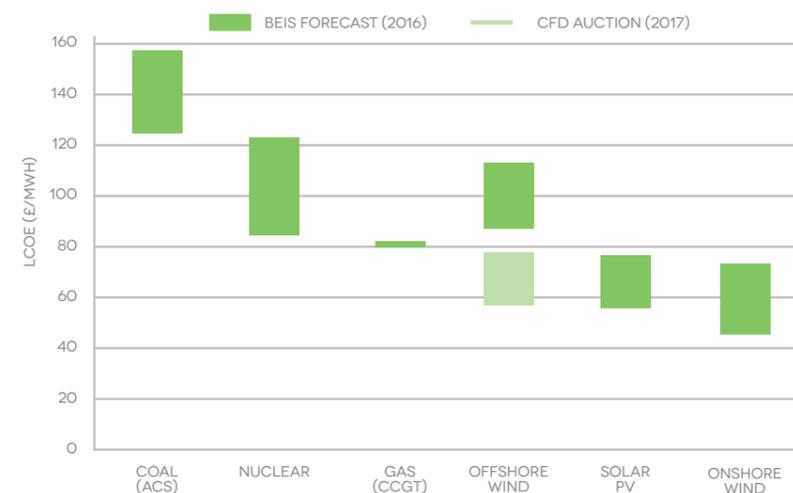


Figure 2: Offshore wind costs compared to other forms of electricity generation.

1.3 OFFSHORE WIND MARKET GROWTH

1.3.1 UK

The UK leads the world in both installed and planned offshore wind capacity, with over 7GW installed by June 2018 and almost 30GW under development. The UK offshore wind capacity represented 36% of the global market at the end of 2017. The UK is committed to delivering 15% of its final energy consumption from renewable energy by 2020, which translates into approximately 30% of electricity generation. Offshore wind is a cornerstone to achieving this through its scalability and affordability.

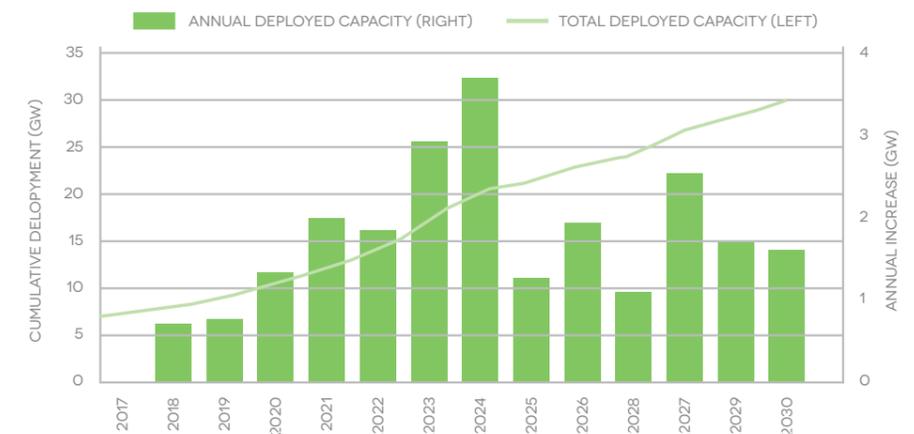


Figure 4: UK offshore wind forecast (capacity) under the Sector Deal Vision

The first offshore wind farms were developed near to shore (5 to 20km) in relatively shallow water depths (less than 30m). Sites were located off the coasts of Walney, Morcambe Bay, Moray, Hull, East Anglia and more, where favourable seabed and logistical conditions exist. These early sites used turbines rated at less than 4MW.

As the sector progressed, larger turbines (6 to 9.5MW) have become available and advances in substructures (monopiles and jackets) have enabled deeper sites (30m to 50m) to become viable (Figure 5).

The Crown Estate and Crown Estate Scotland manage the leasing of seabed around the UK and both organisations are planning further leasing rounds to enable UK capacity to reach 30GW by 2030 (Figure 6). Future sites will include extensions to existing sites along with sites further from shore (over 200km) and as floating platforms become cheaper could include deep water sites in higher wind locations.



Figure 5: Turbine types

UK OFFSHORE WIND FARM DEVELOPMENT STATUS

WINDFARM STATUS

- OPERATIONAL
- UNDER CONSTRUCTION
- CONSENTED
- DEVELOPMENT

TOTAL CAPACITY (MW)

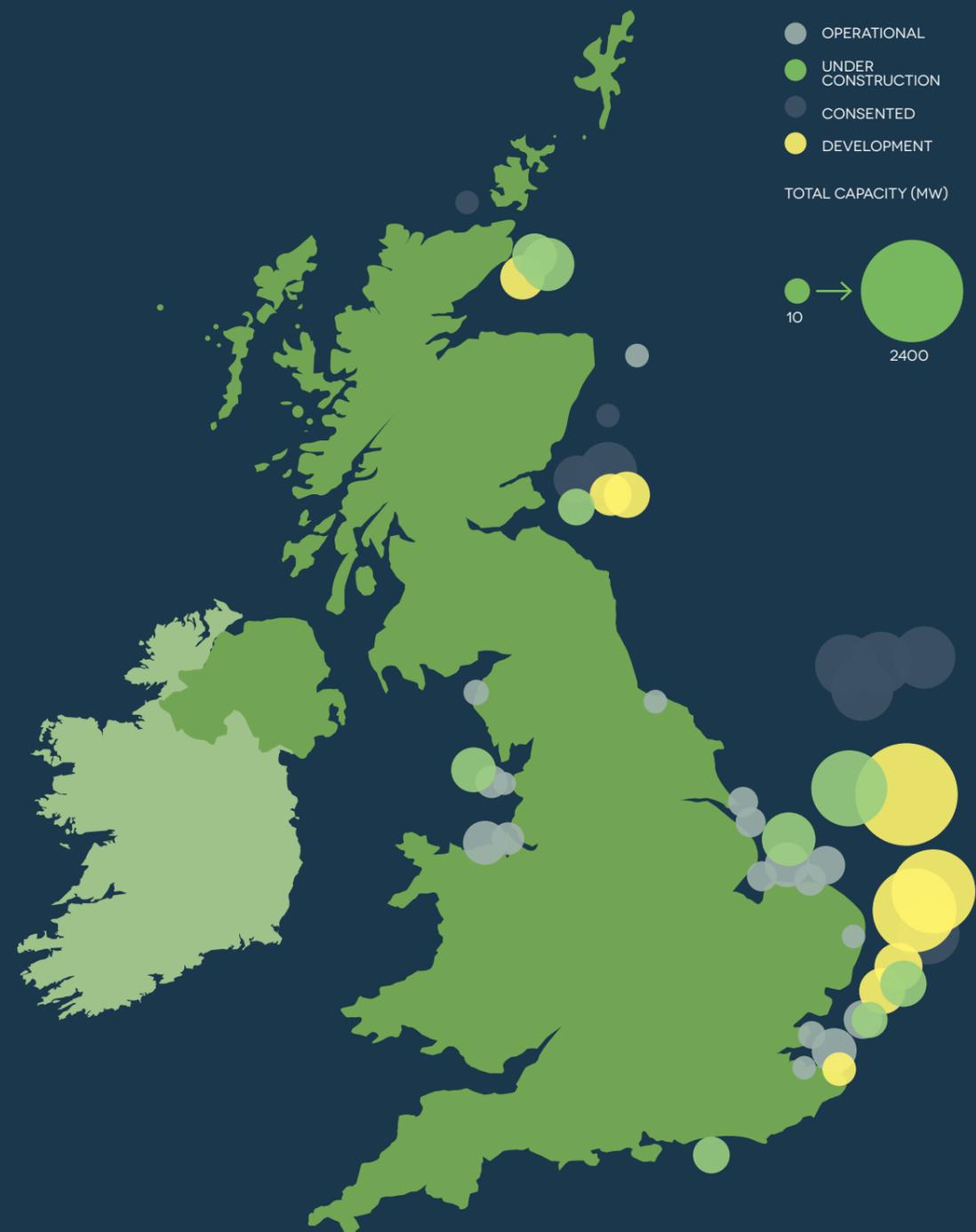
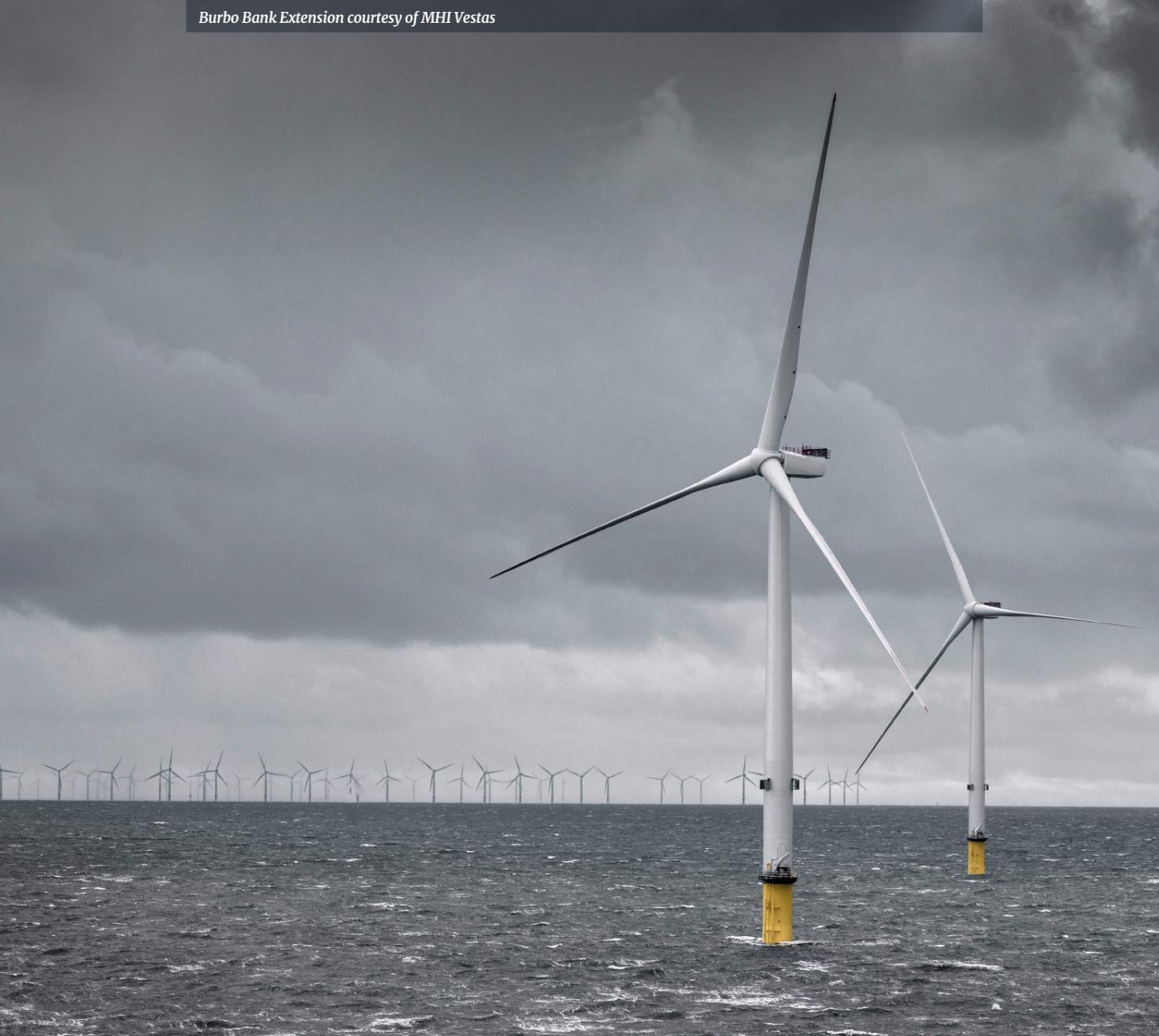


Figure 6: UK offshore wind farm locations

1.3.2 GENERATING CAPACITY EUROPE, USA, ASIA AND THE REST OF THE WORLD

COUNTRY	GW 2018	GW 2030	COMMENTS
United Kingdom	7	30	See previous section
Europe (excl. UK)	9	40	There is significant installed offshore wind capacity in Germany (5.5GW), the Netherlands (1.1GW), Denmark (1.3GW) and Belgium (1GW) and there will be continued development of North Sea and Baltic Sea regions. Wind Europe have developed scenarios for over 70GW outside UK.
China	3	100	China has plans for massive growth in offshore wind leads Asia's offshore wind market. Current installed capacity is 3GW in the South China Sea but China will become the world leader in terms of installed capacity in the mid-2020s and with ambitious plans from regions such as Guangdong has potential for over 100GW by 2030. The Chinese market includes many non-European turbine OEMs including Shanghai Electric, Envision, Sinovel and Goldwind.
United States	0	10	The United States of America (US) has 30MW of installed generating capacity but 22,000MW in planning. The US has lagged Europe due to a strong supply of cheaper onshore renewable energy alternatives and site characteristics that are technically challenging due to ground conditions and deep waters. The market is now picking up pace with government support at state-level development. The current focus of offshore wind activity is off the Eastern seaboard. The first operational offshore wind farm is the 30MW Block Island Wind Farm (December 2016). Massachusetts requires its utilities to buy 1.6GW of offshore wind by 2027. The 800MW Vineyard project (located south of Martha's Vineyard) is on track to begin in-state construction in 2019. Site types on the Westcoast are more suited to deep-water foundation solutions, representing a good opportunity for floating foundation technology providers.
Taiwan	0	6	Taiwan has driven growth of offshore wind and awarded contracts for 4GW with a further 2GW expected by 2025. These projects have seen major participation from European developers and contract wins for UK companies.
India	0	5	India has a strong onshore wind market and has been gathering momentum in offshore wind development. There is potential for a 3 to 5 GW offshore wind auction in 2018. For more information see the Supply Chain, Port Infrastructure and Logistics Study from the Facilitating Offshore Wind in India (FOWIND) group.
Rest of the World	0	20	The rapid cost reduction in European offshore wind is leading many other regions to develop programmes. Amongst these are Japan, Vietnam and Australia. The site conditions vary (sea depth, seabed conditions, extreme weather) and will drive different technology requirements.



THERE IS SIGNIFICANT OPPORTUNITY TO GREATLY EXPAND THE SUPPLY CHAIN THAT SERVES UK PROJECTS FROM COASTAL CLUSTERS, AND EXPORT TO GLOBAL MARKETS ESTIMATED AT £30BN PA BY 2030

2 THE OPPORTUNITY

The UK's world-leading position in terms of offshore wind deployment represents a significant opportunity for UK companies to gain market share. This is particularly true for O&M activities but it also provides a springboard to enable the UK experience to unlock export potential as the global market expands.

2.1 UK PROJECT OPPORTUNITIES

The UK's growing offshore wind supply chain has already delivered many successes, including blade and cable manufacturing facilities, which have delivered British-made components to our most recent UK projects. This has helped us achieve almost 50% UK content in these projects.

As a highly skilled industry that has major hubs in coastal communities across the UK, the industry is well placed to create jobs and boost productivity and earning power in regions in the UK that are most in need of economic growth. This creates opportunities for new business to enter the offshore wind supply chain.

The total (domestic and export) market for UK-provided offshore wind could exceed £10.5bn in 2050 in a high scenario. In the Sector Deal Vision, the total (domestic and export) market for UK-provided offshore wind is expected to reach £4.9bn annually by 2030 and £8.9bn by 2050.

Offshore wind projects are among the largest infrastructure projects in the UK, and they are increasingly delivering our low-cost, low-carbon electricity. There is significant opportunity to greatly expand the supply chain that serves UK projects from coastal clusters, and export to global markets estimated at £30bn pa by 2030.

UK-based supply chain companies lead the world in key services such as design, development, blade design and manufacturing, operations and maintenance and array cabling. However, to meet the growing market demand, businesses providing these services need to anticipate the emergence of larger contracts, larger products and larger projects.

There is significant opportunity for the UK supply chain to grow in areas largely serviced or supplied from overseas at present, including towers, foundations, nacelles, sub-station topsides and export cables. Long project lead times and investment horizons limit the changes to supply chains that can occur near-term, particularly for manufacturing and assembly. However, preliminary analysis suggests that an ambitious and coordinated programme of supply chain innovation and support could raise the UK share of UK projects beginning in 2030, to around 60% (Figure 7). Consistent partnership between developers, OEMs and UK government – focused on maintaining and growing UK productivity and competitiveness, in addition to creating and developing new technologies – is essential in order to realise this potential.

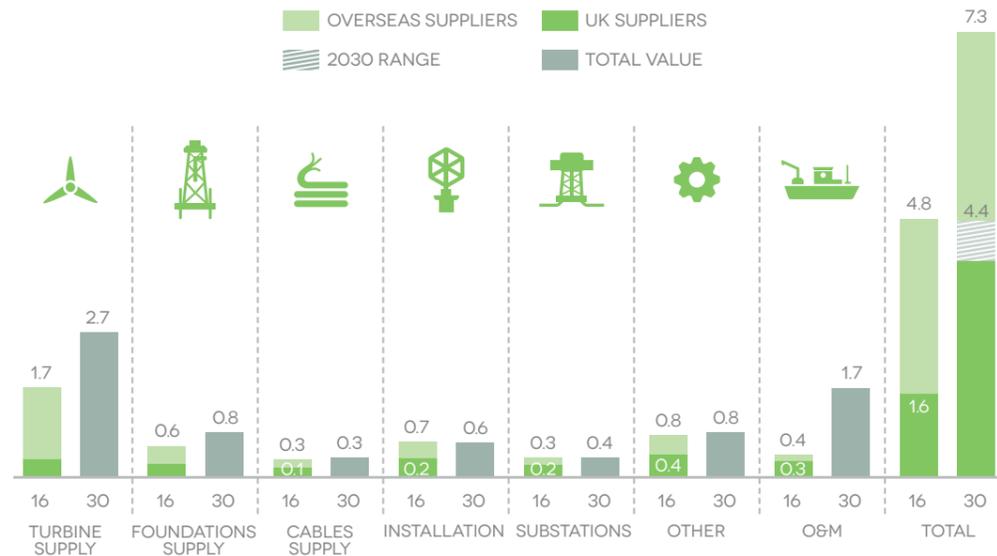


Figure 7: Total estimated annual value of the UK offshore wind market by component, £bn1

The potential for growth is bolstered by the confidence of suppliers to make high impact investment in facilities in the UK. For example, Ørsted's £6 billion investment in offshore wind farms off the Humber, will create hundreds of long-term high-skills jobs in the Humber region. In addition, a combined investment of £310 million from Siemens Gamesa Renewable Energy (SGRE) and ABP in state-of-the-art wind turbine assembly and blade manufacturing plants has taken place in Hull creating up to 1000 jobs directly and indirectly in the supply chain. High-profile investment in UK capability has also been demonstrated by MHI Vestas Offshore Wind (MVOW) who has had blade manufacturing on the Isle of Wight since 2013 employing more than 300 people (Figure 8). Additionally, MVOW has committed a c.£11m investment over 4 years to a significant skills programme that provides an independently recognised composite qualification and has also collaborated with local stakeholders and manufacturers, including GKN Aerospace, to establish the Centre of Excellence for Composites, Advanced Manufacturing and Marine (CECMM). The company has also repurposed a former oil-fired power station at Fawley into a paint and logistics large-scale blade facility'. In addition to these high impact investments there is a thriving supply chain of UK companies supporting all aspects of the windfarm. Further examples of these can be found in the Further Reading section.



Figure 8: MHI Vestas blade manufacturing plant, Isle of Wight

2.2 GLOBAL EXPORT POTENTIAL

There is a significant opportunity for the UK to export offshore wind engineering expertise, components and services to the large European offshore wind market and rapidly expanding global market including China and the USA (Figure 9). Current exports are approximately £0.5bn in 2017 but this has the potential to reach £2.6bn by 2030. By developing local production capabilities, technical expertise and supporting supply chains, the UK can gain competitive advantage in the offshore wind export market.

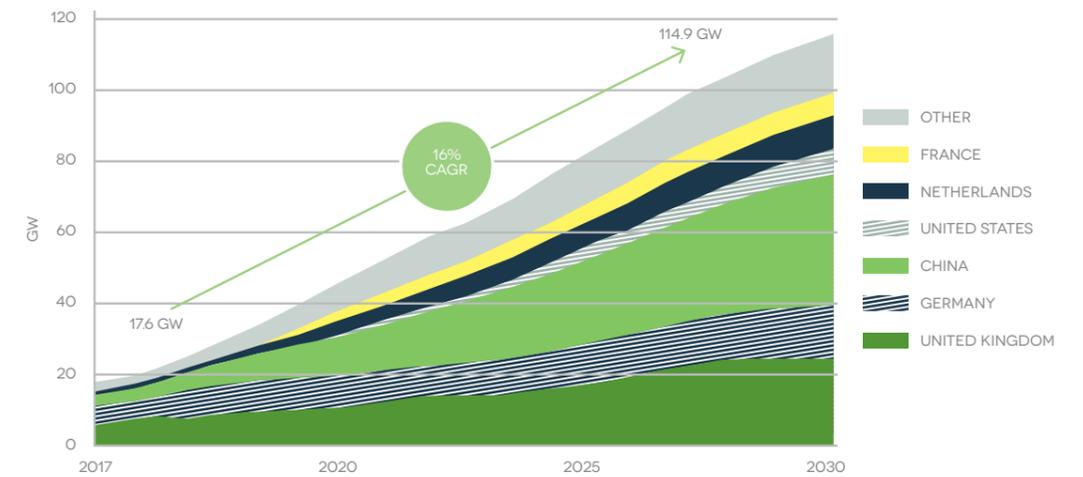
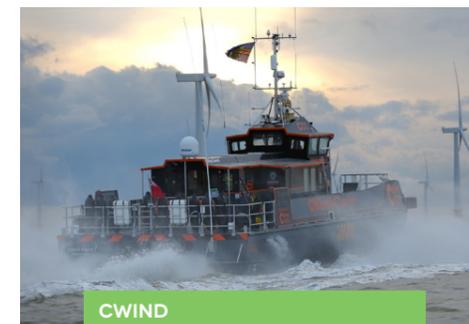


Figure 9: Global offshore wind cumulative installation forecast to 2030 [Bloomberg New Energy Finance]



CWIND

CWind based in Chelmsford has supplied vessels and turbine technicians to work on offshore wind projects in Germany, Denmark, Belgium and the Netherlands in 2017, with contracts ranging from £40,000 to £7,500,000.



JDR CABLES

With manufacturing facilities in Hartlepool and Littleport and a service centre in Newcastle, JDR Cables has supplied power cable products and services to three German offshore wind farms in 2017.

2.3 CROSS-SECTOR SYNERGIES

The offshore wind industry is a relatively young sector with much of the core technology evolving from solutions used in the onshore wind market. There has been a significant input from the oil and gas sector particularly in relation to installation and offshore operations. Conventional power generation engineering has supported turbine design and the aerospace sector has provided experience of composites and manufacturing.

There are many more areas where knowledge from other sectors will be of significant value to the offshore wind sector and where skills can be transferred to and from the industry. In particular, advances in materials, manufacturing, power electronics, robotics and AI all have potential applications. Table 1 highlights some of the potential synergies but it is expected that many more opportunities for cross sector transfer will be identified.

Table 1: Cross-sector technology transfer opportunities

	AEROSPACE	AUTOMOTIVE	OIL & GAS	SPACE	NUCLEAR
Materials	✳	✳	✳		✳
Manufacturing	✳	✳	✳		
Robotics		✳	✳	✳	✳
Health and safety	✳	✳	✳		✳
Reliability	✳	✳			
Asset management	✳				
Harsh environments			✳	✳	✳
Metocean	✳			✳	

2.4 TECHNOLOGY TRENDS

Innovation has been at the heart of the offshore wind industry's remarkable success in driving cost reductions. However, further advances are required to continue to deliver for a global market. The sector is currently developing solutions to meet requirements for larger turbines and deeper water sites.

The most significant area of cost reduction for offshore wind turbines comes from increased rotor diameter and subsequent power output per unit. The first wave of offshore development used 2 to 4MW turbines. As the success of offshore wind increased, new platforms from 6 to 9MW have been developed and this is the range that is currently being deployed. The latest round of auctions for projects to be installed in 2020 onwards are based on the anticipated development of 10MW+ turbines and announcements have been made by the leading turbine OEMs to confirm that these are now under development.

Turbines of 10MW+ will require blades of over 100m compared to existing commercial blades of 80m. The increased turbine power will also have implications for the design and installation of towers and substructures as well as O&M and electrical infrastructure (Figure 10).

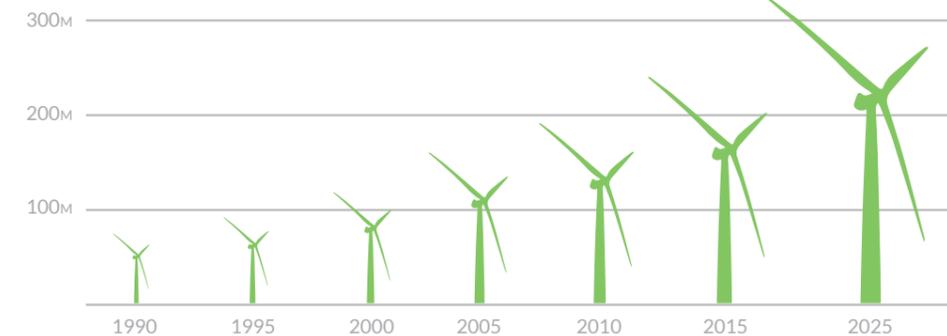


Figure 10: BNEF Figure – turbine development.



“ THE HUB IS THE UK’S PRIMARY COORDINATOR FOR INNOVATION, FOCUSING ON OFFSHORE WIND ENERGY COST REDUCTION AND MAXIMIZING UK ECONOMIC IMPACT ”

The Offshore Wind Innovation Hub (OWIH) gathers input from an industry-led technical advisory group and has developed a set of technology roadmaps that highlight areas for future innovation. Table 2 summarises some of the key areas of innovation.



Table 2: Future technology trends for offshore wind

INNOVATION	UK IMPACT
Advanced O&M	Establishing the UK as a world leader in predictive maintenance for the offshore wind sector and building on UK excellence in Robotics and Artificial Intelligence.
Blade technology and materials	Building on the strong materials knowledge in the UK and the current blades manufacturing bases in Hull and Isle of Wight
Electrical subsystems and cables	Enabling leadership in higher voltage export cables and dynamic cables, with applications to wider markets for electrical infrastructure
Integration with future energy systems	Enabling the use of offshore wind for grid ancillary services; integration with flexible, whole energy systems, including wind to hydrogen for heating and transport;
Disruptive technologies	Building on UK industry leadership in floating wind and generator design
Manufacturing optimisation	Developing substructure and tower designs that are suited to UK facilities enabling increased productivity of UK manufacturing

The UK is a powerhouse of innovation; leading in many key technology aspects needed to improve operations, develop new turbines and facilitate disruptive innovations required to drive economic growth. A continued and dedicated effort to support innovation is the key to sustaining and improving upon the impressive progress to date in reducing costs, delivering high value exportable goods and services and creating new opportunities for emerging high-tech industries. For example, the use of unmanned aerial vehicles (UAVs) for blade inspections has become an increasingly desirable option over traditional manual inspection methods; transforming it into a safer and more efficient data collection process (Figure 11)

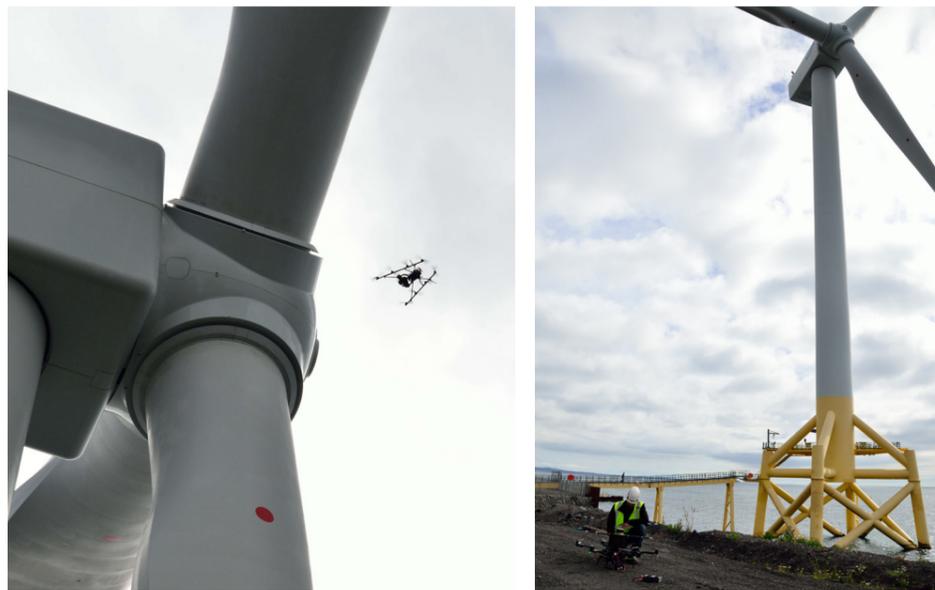


Figure 11: ORE Catapult's UAV blade inspection at Levenmouth Demonstration Turbine in Scotland.

3 SEIZING THE OPPORTUNITY

To engage in the offshore wind sector, it is useful to understand the major project phases and the structure of the supply chain. The following sections provide an overview of these areas.

3.1 PROJECT LIFECYCLE

Offshore wind farms are some of the largest construction projects in the UK accounting for 21% (£4.1 billion) of construction contracts in 2016. The initial development of projects is usually by utilities with the necessary balance sheet to cover the early investment risk.

A typical offshore wind farm project consists of a 3 to 5-year development phase followed by a 2-year construction phase and a 25-year operational phase. The construction phase of an offshore wind farm (turbine manufacture, balance of plant manufacture and installation) is the most capital intensive and includes about 56% of lifetime costs. O&M activity (including transmission costs) accounts for up to 40% of lifetime costs and offers a significant opportunity for UK industry.

3.2 SUPPLY CHAIN STRUCTURE

There are several alternative approaches to project ownership but typically developers will recycle capital by selling stakes in operational projects to develop further wind farms. The operational phase of an offshore wind farm presents lower financial risk than projects in development and construction, and ownership of offshore wind farms by institutional investors at the operational phase is becoming commonplace.

The project developer will typically procure the design, supply and installation of turbines from the turbine OEM and one or more Tier 1 equipment and installation contractors. The following diagram shows the relative costs of the major contract packages (Figure 12).

Contracts for manufacture and construction are usually signed two years before construction although in some cases, large supply contracts are sourced earlier via strategic framework agreements or strategic company alliances. The manufacture of balance of plant equipment and installation services may be signed later than turbines but designs are finalised early on in this process.



Figure 12: Lifetime costs for a typical offshore wind farm

3.3 SUPPORT FOR SUPPLY CHAIN GROWTH

3.3.1 POLICY

The UK Government's Clean Growth Strategy recognises the low carbon benefits of offshore wind and singles it out as a sector where the UK has world leading expertise and technology. This reputation is built on the remarkable growth of the sector and has resulted in government commitment to provide £557m of subsidy support in future auctions. In July 2018, it was announced that auctions will be held every two years from May 2019 and are expected to deliver 1GW to 2GW each year throughout the 2020s. The need for continued development of offshore wind is supported by the Committee for Climate Change which recommends the targets for the UK's carbon budget.

Offshore wind is also prominent in the UK Government Industrial Strategy which recognises that the growing offshore wind market is one of the biggest export opportunities. The world market for offshore wind is estimated to reach £30bn by 2030 and £55bn by 2050. With UK companies already leading in capacity and expertise the opportunity for success in exporting services is huge.

The Department for International Trade (DIT) can support companies with UK Export Finance to enter the competitive European market. DIT also offers a range of support such as facilitating relationships with investors and supporting development strategies with UK businesses to win contracts overseas. The UK has demonstrated its significant export potential and is providing expertise to growing offshore wind markets overseas.

The Department of Business, Energy and Industrial Strategy is accepting applications from industry for a Sector Deal. OWIC have submitted a proposal on behalf of the UK offshore wind industry. This inspired OWIC to invite Martin Whitmarsh's review of the Supply Chain. His review will be accompanied by a range of work streams addressing; future supply chain products and services, productivity improvement, expansion and disruption and capacity development.

3.3.2 INNOVATION

Innovation support for the offshore wind sector is provided by UKRI, Innovate UK and directly from BEIS in the case of the Energy Entrepreneur Fund. The Offshore Wind Innovation Hub (OWIH), funded by BEIS and jointly delivered by the Offshore Renewable Energy (ORE) Catapult and The Knowledge Transfer Network (KTN) develops technology roadmaps and helps to coordinate for innovation funding for the offshore wind sector in the UK. The Offshore Renewable Energy Catapult provides test facilities, engineering skills and deep sector knowledge to support the growth of UK companies in the offshore wind sector.

3.3.3 REGIONAL

There are many regional programmes that can provide support for companies interested in working in the offshore wind sector. The following diagram provides a summary of these. Further information and guidance on support for companies looking to establish themselves in the offshore wind industry can be found in ORE Catapult's 'An Innovator's Guide to Finance & Funding'.

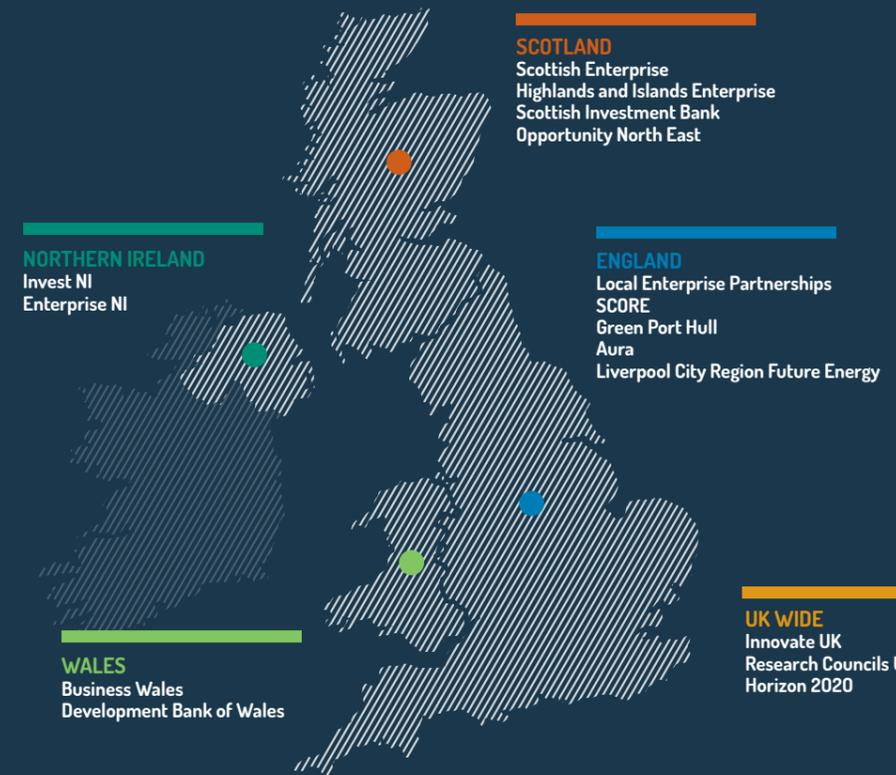


Figure 13: Regional support

4 HOW TO FIND OUT MORE

If you would like to learn more about UK offshore wind supply chain opportunities in your region, Martin and the Supply Chain Review Team will be hosting a series of UK Autumn Roadshows and would be delighted to see you at one of these events.

These OWIC industry-led events will be supported by ORE Catapult, the Offshore Wind Innovation Hub and the Operations & Maintenance Centre of Excellence. Further information along with the dates and locations will soon be available at ore.catapult.org.uk where you will also be able to register.

Alternatively, please contact the team at owicsupplychaindevelopment@ore.catapult.org.uk if you would like more information on the upcoming events or if you have any questions, comments or feedback on this document. We would be delighted to hear from you!

5 FURTHER READING

UK POLICY CONTEXT

UK Industrial Strategy

www.gov.uk/government/topical-events/the-uks-industrial-strategy

UK Clean Growth Strategy

www.gov.uk/government/publications/clean-growth-strategy

UK MARKET

Cost Reduction Monitoring Framework

www.crmfreport.com

Innovators Guides to...

www.ore.catapult.org.uk/work-with-us/smes

Renewable UK Reports

www.renewableuk.com/page/UKWEDhome

BEIS Electricity Generation Costs, Nov 2016

www.gov.uk/government/publications/beis-electricity-generation-costs-november-2016

The Committee on Climate Change, June 2018

www.theccc.org.uk/publication/reducing-uk-emissions-2018-progress-report-to-parliament

TECHNOLOGY TRENDS

Offshore Wind Innovation Hub

www.offshorewindinnovationhub.com

Offshore Wind Energy – ‘Owners Workshop Manual’

www.renewableuk.com/news/297780/Offshore-Wind-Energy---Owners-Workshop-Manual.htm

GLOBAL MARKET

International Energy Agency (IEA) – ‘World Energy Outlook 2017’

www.iea.org/weo

Bloomberg New Energy Finance – ‘New Energy Outlook 2017’

www.about.bnef.com/new-energy-outlook

INNOVATION SUPPORT

Scottish Enterprise

www.scottish-enterprise.com/services/develop-your-organisation/offshore-wind-expert-support-programme/overview

SCORE

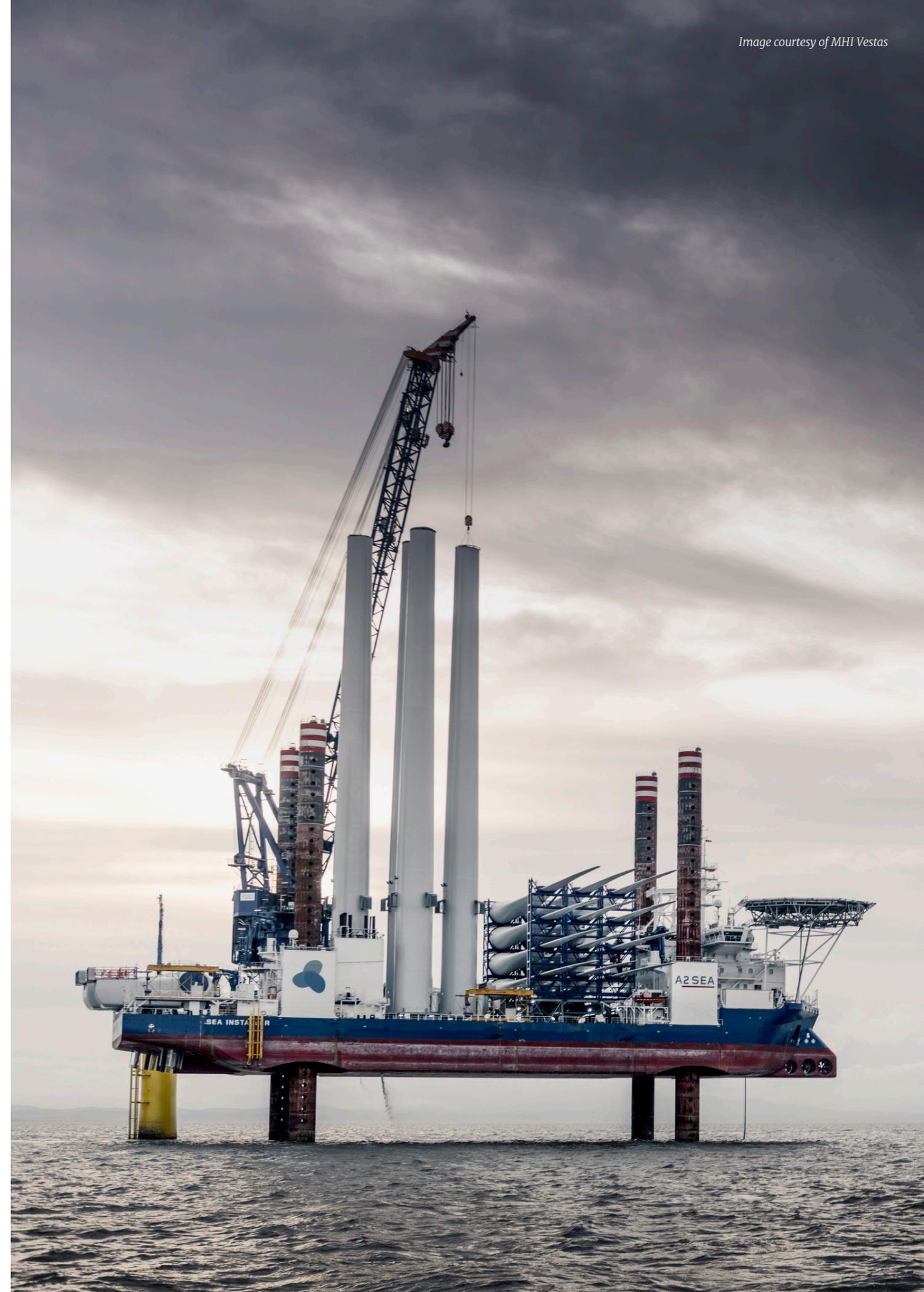
www.scoregrants.co.uk

Green Port Hull

www.greenporthull.co.uk/business-support-investment

Offshore Wind Regenerating Regions – ‘Investment and Innovation in the UK’

An introduction to companies actively supporting the UK offshore wind sector.



CATAPULT
Offshore Renewable Energy

ORE.CATAPULT.ORG.UK
[@ORECATAPULT](https://twitter.com/ORECATAPULT)
OWICSUPPLYCHAINDEVELOPMENT@ORE.CATAPULT.ORG.UK

**OffshoreWind
IndustryCouncil**

OWIC@RENEWABLEUK.COM

IN PARTNERSHIP WITH

SIEMENS Gamesa
RENEWABLE ENERGY

MW
MHI VESTAS OFFSHORE WIND


SCOTTISHPOWER
RENEWABLES


innogy

13.4 Feedback from Offshore Wind Supply Chain Roadshows

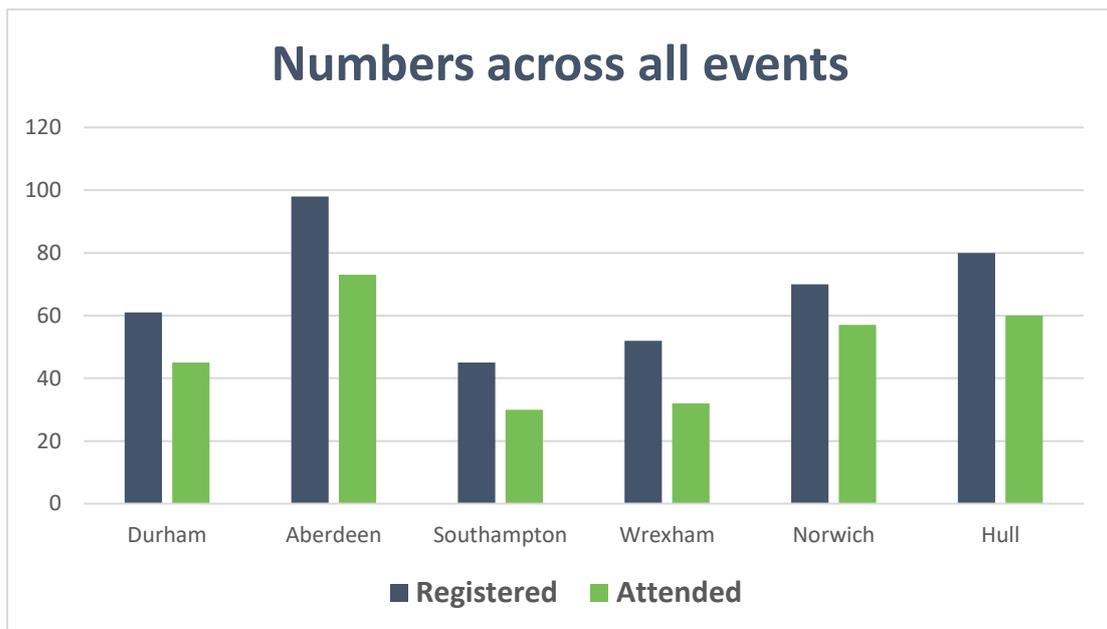
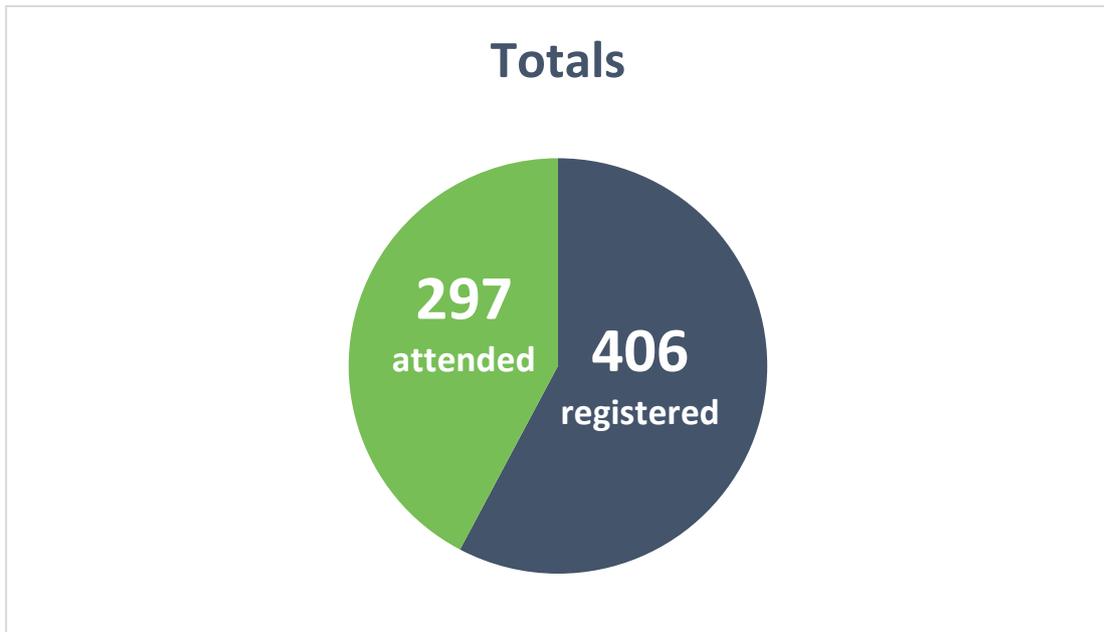
UK OFFSHORE WIND INDUSTRY SUPPLY CHAIN EVENTS

November & December 2018

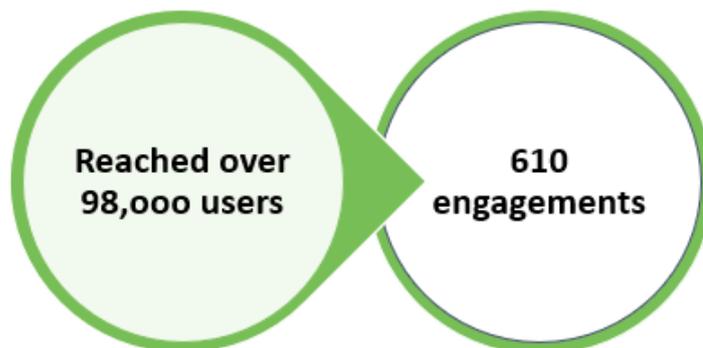
EVENTS SUMMARY



Attendance



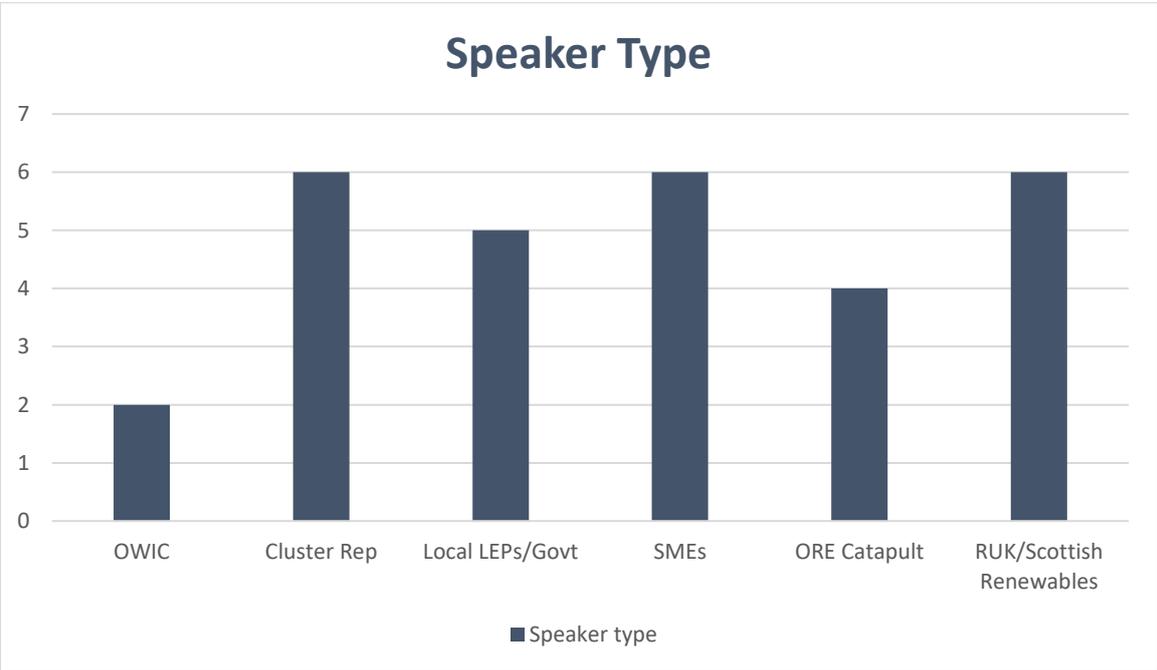
ORE Catapult Social Media Campaign (Twitter, LinkedIn, Facebook)



6 locations



50
speakers



Slido

Polls

Does the Sector Deal and the promise of a 30GW+ pipeline provide the stimulus needed for new supply chain investment?

Yes
 93 %

No
 7 %

Yes
 80 %

No
 20 %

Yes
 69 %

No
 31 %

Yes
 83 %

No
 17 %

Yes
 90 %

No
 10 %

Should there be a UK content requirement in UK projects?

Yes



No



Yes



No



Yes



No



Yes



No



Yes



No



Popular questions

Aberdeen



Anonymous

0 12

Lots of opportunities in OW but how do we stop tier 1s going back to their usual supply chain which is abroad?



Anonymous

0 6

How can new entrants engage with offshore wind procurement processes?



Anonymous

0 5

Nuclear has a Sector deal and a manufacturing research facility at Sheffield. Oil and Gas is working on a deal. What dialogue has OWIC had with these sectors ?



Anonymous

0 4

Is there a risk that an all inclusive policy for Scotland becomes a barrier to establishing areas of economic scale and centres of excellence ?



Anonymous

0 3

How do BEIS view conflict between LCOE and UK content. The lower the strike price becomes the bigger the influence of low cost sourcing for winning business.

Southampton



Anonymous

0 5

How do you see that advanced O&M can be achieved in the UK via predictive maintenance when the necessary data doesn't flow through the supply chain?



Anonymous

0 5

Where does floating offshore wind fit in the growth projections in the UK?



Anonymous

0 4

Is there enough 'local content' in the UK's offshore wind industry, and what can be done to deliver more?



Anonymous

0 3

What % of supply chain is British owned? What % of profit remains in U.K.?



Anonymous

0 2

What's missing from the Solent to become a true blades hub (excuse pun)? What's preventing expansion to meet the vast increase in number of blades required?

Wrexham



Anonymous

0 7

What can be done to raise awareness of the range of (lesser known) UK suppliers as well as the upcoming development projects for suppliers to be involved in?



Anonymous

0 4

How can the Tier 1 suppliers play a role in helping to increase UK content?



Anonymous

0 4

What can we do to kick-start a North Wales cluster?



Anonymous

0 3

How can I find out about opportunities for supplying projects overseas?



Anonymous

0 3

How can we increase the number of British developers that can compete globally with existing developers like Orsted and Innogy?

Norwich



Chris Maloney

0 5

How can we integrate with the electricity storage sector better (Tesla batteries etc) to help smooth out continuity of supply. The wind doesn't always blow.....



Anonymous

0 5

Why does the Catapult not have an office in the East of England, the centre of the offshore wind revolution in the UK



Anonymous

0 5

Large organisations in our industry dominate the political and decision making agenda, how do we really involve the multitude of small companies involved...



Anonymous

0 4

Is there scope for local skills development. Much of workforce travels in. What can we do to support local people enter market and support skills development?



Chris Maloney

0 4

How can we convince govt that wind industry/GT Yarmouth/Lowestoft needs the A47 Norwich to GYarmouth upgrade to ensure wind industry growth?

Hull



Anonymous

0 8

Are the owner operators and OEM's not concerned about the innovative business' they miss out on due to onerous "purchasing approval" processes?



Anonymous

0 8

How is Offshore wind working with other energy technologies such as Storage and Grid requirements.



Anonymous

0 7

How are the SMEs represented?



Anonymous

0 7

For continued cost reduction, what are the key innovations required from the supply chain?



Anonymous

0 6

What are the owner operators and OEM's doing to encourage new entrants into the supply chain?

WORKSHOPS SUMMARY

TECHNOLOGY INNOVATION WORKSHOPS

The Technology Innovation workgroups were structured around the following four topics:

1. Biggest Opportunities for Innovation – what are the main focus areas for innovation in this region?
2. Opportunity to work with other Sectors – are there opportunities to learn from other sectors?
3. Sector Deal Role in Innovation – what support (regulatory, funding, knowledge, skills) is needed?
4. Biggest Wins in Innovation – what areas have the biggest potential for UK growth?

Across all the events the following three themes emerged most frequently:

- Innovation is essential to enable the growth of UK companies and increase exports.
- Access to clear problem statements from developers would enable innovators to develop solutions.
- Increased data sharing would accelerate innovation; particularly around performance, reliability and O&M.

DURHAM

The Technology Innovation group in Durham included a turbine OEM and several well established – North East supply chain companies. Many participants highlighted the strength of the subsea technology sector in the North East and suggested more could be done to develop this for offshore wind.

- Subsea engineering is a strength in the North East that has potential for growth in OSW.
- There is limited access in the UK to insurance products to de-risk new product introduction.
- There are opportunities to increase use of data and digitalisation across the supply chain.
- There was broad support for innovation programmes run by Innovate UK, ORE Catapult and Carbon Trust.

ABERDEEN

The Technology Innovation group in Aberdeen included many smaller companies with experience in oil and gas and an interest in diversification to offshore wind.

- There is not enough data sharing from developers to accelerate innovation.
- Innovators expressed concerns around the exclusive approach to IP taken by developers.
- It can be difficult to find contacts in procurement teams who are interested in innovation.

SOUTHAMPTON

The Technology Innovation group in Southampton included experience from the wider renewables sector including onshore wind, solar and tidal. Discussion focussed on the barriers to disruptive innovation in what is becoming a large-scale sector.

- Introduction of innovation includes risks. The sector needs innovation programmes to help mitigate these risks.
- Demonstrators are required for some of the larger innovations e.g. foundations and floating wind.
- Increased data sharing would help support innovation.

WREXHAM

The Technology Innovation group in Wrexham focussed on data, floating wind, cables and AUVs. It was felt that the North West was not as well coordinated as some of the other clusters but still has a lot of potential from cross-sector experience.

- Improvements in reliability require coordinated sharing of data; possibly via JIP.
- Knowledge from aerospace, automotive and defence should be applied to offshore wind.
- Strategic approach needed to increase capex contribution to UK projects.

NORWICH

The Technology Innovation group in Norwich included many existing supply chain companies and oil and gas sector experience. The focus was on how the cluster can further showcase the strength in the region.

- Strong oil and gas O&M experience can support offshore wind sector.
- Sensing technology from nuclear, automotive and water sectors could be applied to offshore wind.
- Public funding for targeted innovation for offshore wind is essential.
- Improved early access to developer and Tier 1 requirements via web portal could help.

HULL

The Technology Innovation group in Hull had a significant focus on O&M and support for innovation. The importance of data sharing to empower digitalisation was emphasised.

- There are many opportunities to reduce O&M costs through remote inspections and data analysis.
- There are wider benefits of designing for sustainability – less waste and reduced impact.
- There is an opportunity for the sector deal to encourage collaboration and data sharing.

FUNDING/EXPORT WORKSHOPS

The Funding & Export workgroups were structured around the following three questions/discussion topics:

1. Do you believe there are funding options available for UK supply chain aiming to expand their business?
2. If funding was to be made available to increase productivity for UK supply chain then where do you believe it would be best to focus this...Innovation/Support for Contracting/Training/Manufacturing/Other?
3. Does your business consider exporting your offshore wind services a key growth area?
4. Do you believe being a UK supplier for offshore wind can give you a competitive edge in the global market?
5. If planning to export, are you clear on the options available to support you in doing this?
6. Are there options that you would like to see available to support you in exporting? Do these focus on Financial Support/Relationship Building/General advice on engaging in global markets/other?

Across all of the events the following themes emerged most frequently:

- Lack of funding currently available for training and performance warranty bonds
- Funding mechanisms required to boost UK productivity and innovation in future projects
- UK Knowledge Base is a key export opportunity in emerging markets.
- How can the Sector Seal support UK supply chain partnerships and consolidation?

DURHAM

- Difficult having a fully trained workforce ready at short notice with multiple training certificates required.
 - Local grants for training should be made available from LEPs/Local Government
 - Energy Passport proposal under People and Skills Working Group
 - Staff should be able to access loans for training so they can gain the qualifications themselves and be more mobile in the workforce
- Difficulties in securing funding performance and warranty bonds due to the high risk placed on supply chain by developers
 - Tees Valley Catalyst Fund (mentioned in report)
 - British Business Bank (Action to be taken by Benj)
- Difficult maintaining Innovation IP in the UK when exporting offering to other countries where the most competitive solution is to manufacture abroad.

ABERDEEN

- Sector Deal must develop a financial mechanism for increasing productivity, particularly in Scotland
- More funding opportunities should be available for micro-SMEs who are unable to provide match funds.

- Sector Deal should create an opportunity to bring regional strengths together and identify the skills gaps + allocate funding for skills development.

SOUTHAMPTON

- Should identify key links to other Sector Deals e.g. In UK Manufacturing
- Public/private funding appears to be on hold in light of Brexit, but we should be building more and investing more in the UK *because* of Brexit.
- Suppliers find it difficult getting to the right people who can support with funding.

WREXHAM

- Not enough communication within the industry and uncertainty over the right people to speak to regarding funding/export opportunities.
- Export is easier for other countries like Germany – closed supply chain
- More funding for innovation needed but how would it be allocated?

NORWICH

- Developers should work collaboratively to agree common routes into the industry to strengthen employment and career development i.e. “Collaborate to compete”
- Push for more UK manufacturing (e.g. Towers) near the east coast ports – leads to export opportunities and stronger investment in growing the skills base in the area.
- More structured programmes to enable young people to realise the career opportunities should be given greater support.
- There is an opportunity for a greater focus on driving innovation and potentially strengthening the role of Orbis in being a Centre of Excellence for Innovation for the cluster. This could facilitate stronger links with local universities and the ORE Catapult.
- Further support to strengthen the supply chain is vital and a more holistic approach across the “all energy” sector should be encouraged to identify opportunities for UK businesses to “scale up” and “flex” to service O&g, wind, new nuclear etc.

HULL

- “Knowledge-based” services are likely to be an easier and potentially larger export opportunity than Capital goods. Many companies already working in both US and Taiwan where using the UK knowledge base is essential to the development of these new markets.
- With a large number of emerging markets for offshore wind, each different cultural and geographical challenges, companies looking to export need a clear focus and fully understand the scope and boundaries of their offer to succeed.
- Partnerships and consolidation are essential to succeeding in new markets – how can the Sector Deal and Clusters support this?
- For UK companies to capitalise and maximise export opportunities, they must have an IP basis to their offer that can clearly identified and protected.

MARKET ACCESS/KNOWLEDGE WORKSHOPS

The Market Access workgroups were structured around the following three questions topics:

- Do you believe you have access to quality information on the market capacity and opportunity for offshore wind in the UK?
- Do you believe the industry can do more to open the market to new entrants and other industries?
- Do you believe the route to market is clear for new entrants and other industries?

DURHAM

- For newer and smaller businesses, it is very difficult to find the right person to speak to in Tier 1 companies
- Communication of requirements, including skills and technology is poor
- More needs to be done to broaden the supply chain, rather than reducing it, as per oil and gas

ABERDEEN

- Information from Tier 1 companies is not always visible, especially to new entrants, and for those already in the sector, it's difficult to know who to speak to
- Is there enough information distinguishing the differences between offshore wind and oil and gas, for those keen to transfer?
- There are too many separate portals and people are suffering from portal fatigue – a central system should be considered

SOUTHAMPTON

- There is information out there, but you have to pay for it mostly and that's a barrier for smaller companies.
- Information such as when packages will be tendered, should have a much higher and wider profile. A central repository for all developers in CfD3 to put out bidding structures for the supply chain.
- ISO is a time consuming and expensive process for smaller companies, but it is hard to win work without these types of accreditations.
- One key common denominator between the sectors is transferrable skills, e.g. marine/working in a marine environment with oil and gas. How can the offshore wind industry coordinate with other sectors to learn and understand more.

WREXHAM

- TBC

NORWICH

- Demand for products is easy to understand, but not clear how to get to the customer. How do supply chain companies find the right person to speak to?
- Capability does not equal experience – tenders often require a proven track record in the sector/offshore projects, which is impossible for a new market entrant.
- There seems to be a disconnect between the senior strategic “visionaries” and then those in procurement departments who are much more risk averse.

How to help?

- Help to explain to oil and gas supply companies what they can offer offshore wind – what is the demand
- Developers are good, but the OEMs are more conservative – need to get the developers and OEMs together with supply chain - more share fair type events?
- Greater transparency through supply chains about who is doing what (get tier 1 and 2 companies to talk about who is in tier 3
- Need to support development of skills across the sector.

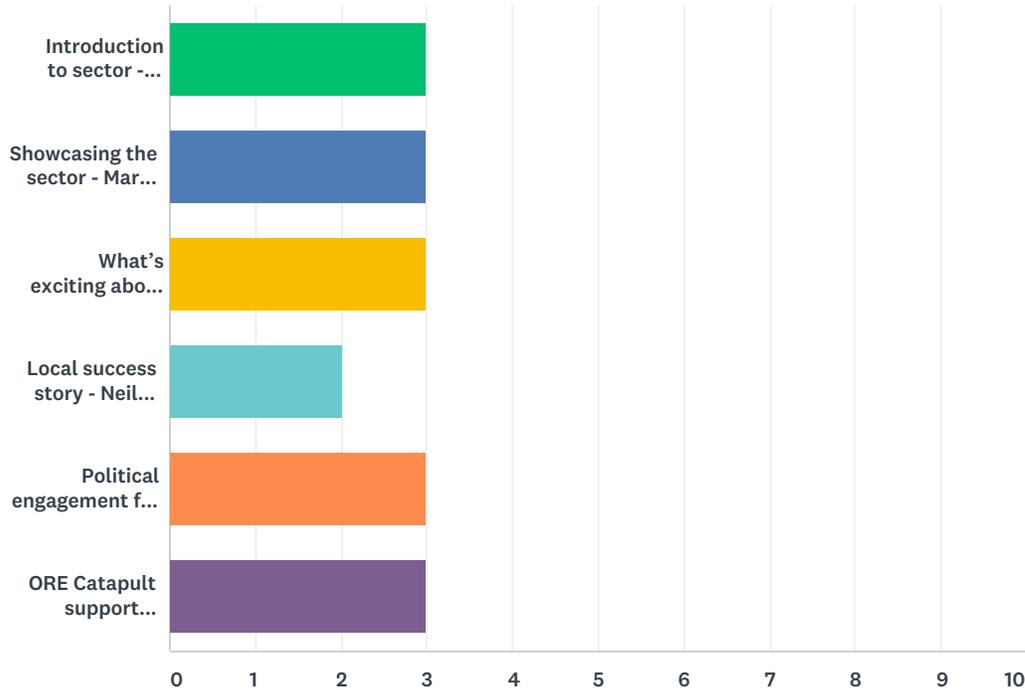
HULL

- Can be very frustrating working with big companies – with complex bureaucracy
- The larger companies can show of appetite to speak to SMEs to help them understand the challenges– even with NDAs in place
- There is a reluctance to embrace something new, often sticking to the same supply chain
- Hard to find the right person to talk to in the big companies
- Need a more structured supply chain. It’s hard for the large companies to deal with SMEs knocking on the door.
- Collaboration is key for new entrants - look at who has already got a position with industry. Who can you work with to add value to. Collaboration is the key.

SURVEY
MONKEY
FEEDBACK

Q1 How informative and useful did you find the following sessions?

Answered: 1 Skipped: 0

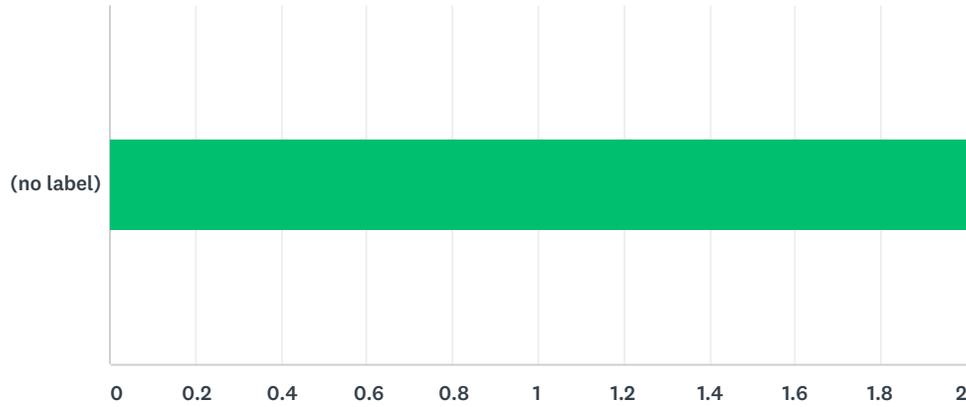


	NOT USEFUL	QUITE USEFUL	USEFUL	VERY USEFUL	I DID NOT ATTEND THESE SESSIONS	TOTAL	WEIGHTED AVERAGE
Introduction to sector - Benj Sykes, OWIC	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00
Showcasing the sector - Martin Whitmarsh and team	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00
What's exciting about being the region? Per Gamre, Equinor	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00
Local success story - Neil Harrison, OSBIT	0.00% 0	100.00% 1	0.00% 0	0.00% 0	0.00% 0	1	2.00
Political engagement for supply chain - Nathan Bennett, RenewableUK	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00
ORE Catapult support (OWIH/OMCE) Andrew Macdonald + Stuart Barnes, ORE Catapult	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00

#	ANY COMMENTS ON THESE SESSIONS WELCOME	DATE
1	Sessions were informative, but didn't provide any new information or updates, also think the audience was pretty well versed in the sector deal already and what it is trying to achieve. It was a good session and informative, however if we are trying to attract new firms into the supply chain we need to get a more varied audience and arguably have a number of developers speaking around the UK and overseas pipeline of opportunities. RUK and ORE presentations useful, but the focus needs to remain with Developers to lead.	11/14/2018 2:34 PM

Q2 How engaging and useful did you find Slido?

Answered: 1 Skipped: 0

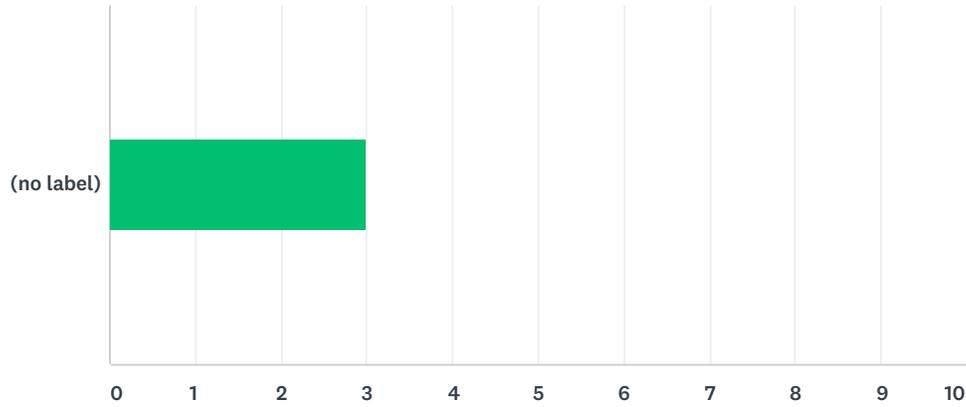


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	100.00% 1	0.00% 0	0.00% 0	0.00% 0	1	2.00

#	ANY OTHER COMMENTS WELCOME	DATE
1	Few comments were raised, however again its likely down to the fact that the knowledge in the room around sector deals was probably already pretty high.	11/14/2018 2:34 PM

Q3 How engaging and useful did you find the workshop sessions?

Answered: 1 Skipped: 0

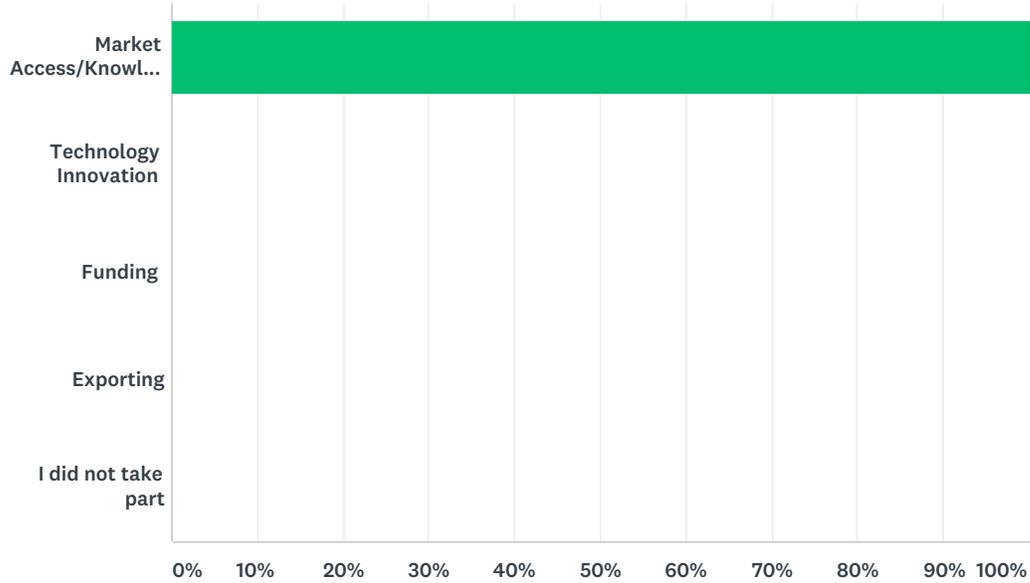


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	1	3.00

#	ANY OTHER COMMENTS WELCOME	DATE
1	Workshop was useful, although there was no wash up or feedback following the sessions.	11/14/2018 2:34 PM

Q4 Which workshop session did you attend?

Answered: 1 Skipped: 0



ANSWER CHOICES	RESPONSES	
Market Access/Knowledge	100.00%	1
Technology Innovation	0.00%	0
Funding	0.00%	0
Exporting	0.00%	0
I did not take part	0.00%	0
TOTAL		1

Q5 What was your main takeaway from the workshop discussion you attended?

Answered: 1 Skipped: 0

#	RESPONSES	DATE
1	Aspects of the supply chain very well informed, others less so however for the latter there needs to be a recognition that the information and support tools are available to them, they are simply not accessing them.	11/14/2018 2:34 PM

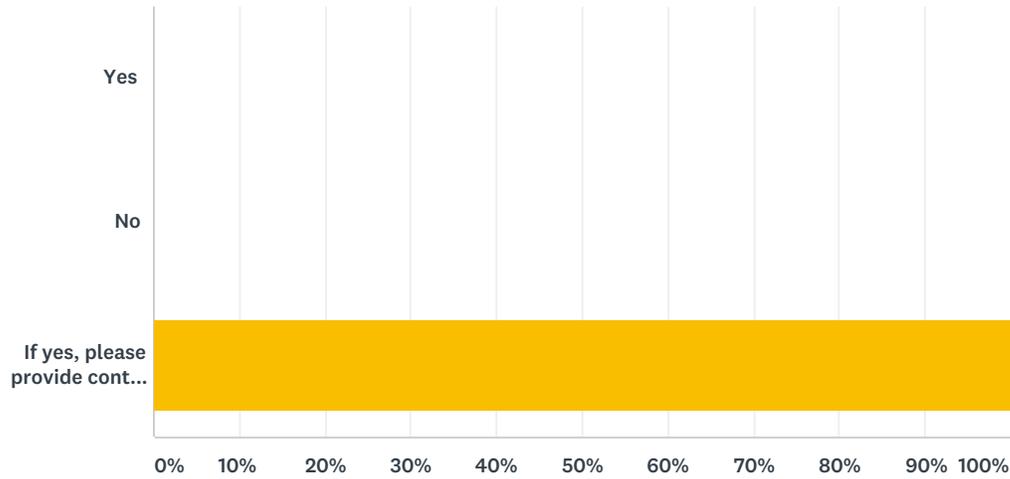
Q6 Do you have any general feedback or suggestions for future supply chain events?

Answered: 1 Skipped: 0

#	RESPONSES	DATE
1	more advance notice of the event is required, this event was squeezed into North East Week, which in principle was a good idea, however the reality is that we lost a number of attendees due to supporting other initiatives as part of the week long programme.	11/14/2018 2:34 PM

Q7 Would you like to discuss anything further with any of the supply chain team?

Answered: 1 Skipped: 0

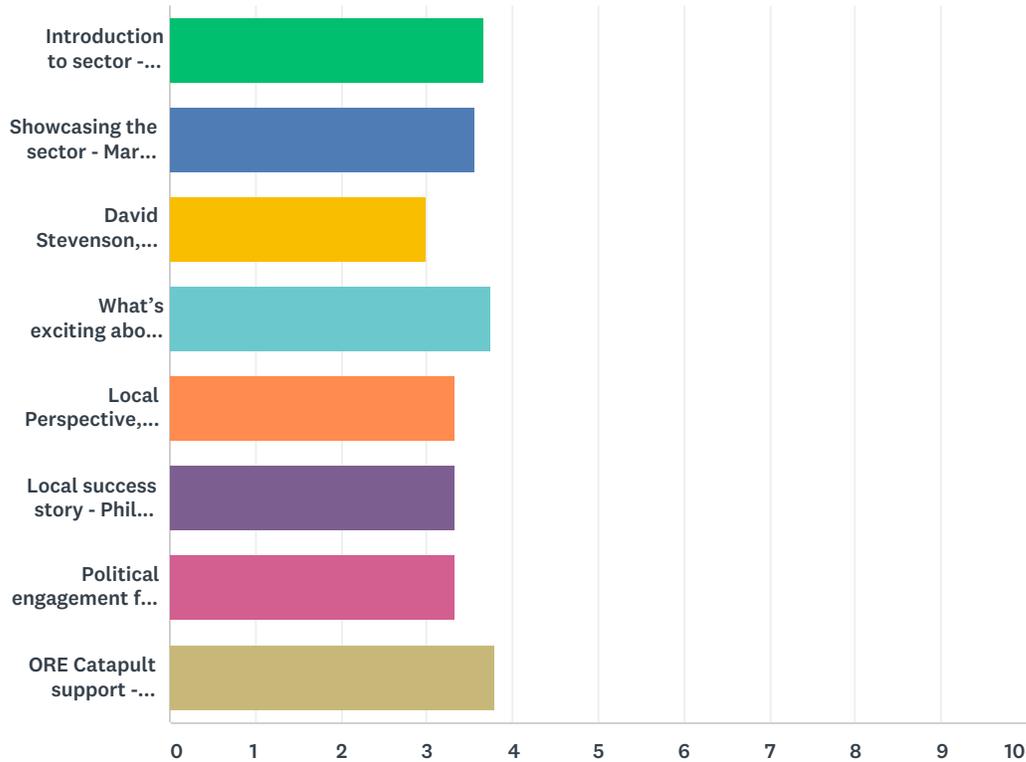


ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	0.00% 0
If yes, please provide contact details and a short summary of requested follow up,and we will be in touch.	100.00% 1
TOTAL	1

#	IF YES, PLEASE PROVIDE CONTACT DETAILS AND A SHORT SUMMARY OF REQUESTED FOLLOW UP,AND WE WILL BE IN TOUCH.	DATE
1	Happy to discuss future planning and structure of the events as per above comments.	11/14/2018 2:34 PM

Q1 How informative and useful did you find the following sessions?

Answered: 9 Skipped: 0



	NOT USEFUL	QUITE USEFUL	USEFUL	VERY USEFUL	I DID NOT ATTEND THESE SESSIONS	TOTAL	WEIGHTED AVERAGE
Introduction to sector - Clark MacFarlane, OWIC	0.00% 0	0.00% 0	33.33% 3	66.67% 6	0.00% 0	9	3.67
Showcasing the sector - Martin Whitmarsh and team	0.00% 0	11.11% 1	22.22% 2	66.67% 6	0.00% 0	9	3.56
David Stevenson, Scottish Government	0.00% 0	44.44% 4	11.11% 1	44.44% 4	0.00% 0	9	3.00
What's exciting about being the region? Dan Finch, EDPR	0.00% 0	0.00% 0	25.00% 2	75.00% 6	0.00% 0	8	3.75
Local Perspective, Isla Robb	0.00% 0	22.22% 2	22.22% 2	55.56% 5	0.00% 0	9	3.33
Local success story - Phil Taylor	0.00% 0	11.11% 1	44.44% 4	44.44% 4	0.00% 0	9	3.33
Political engagement for supply chain - Claire Mack, SR and Dujon Goncalves-Collins, RUK	0.00% 0	0.00% 0	66.67% 6	33.33% 3	0.00% 0	9	3.33
ORE Catapult support - Andrew Macdonald, ORE Catapult	0.00% 0	0.00% 0	22.22% 2	77.78% 7	0.00% 0	9	3.78

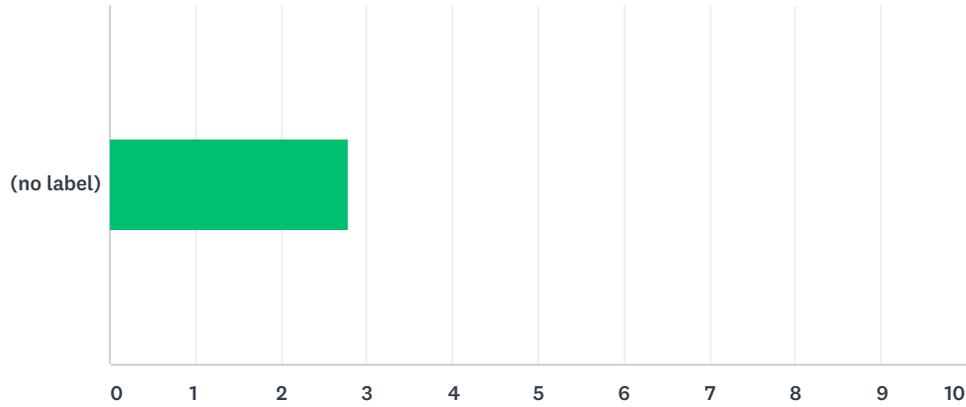
#	ANY COMMENTS ON THESE SESSIONS WELCOME	DATE
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Offshore Wind Supply Chain Event - Aberdeen

1	It was a great event and extremely well organised and professionally run. Well done to Vicky and the team at ORE Catapult for pulling together an excellent and memorable day with great networking opportunities between speakers and delegates :D	11/21/2018 2:43 PM
2	Clark MacFarlane really set the scene very well. Everything subsequent to the first session was referenced to it. Thank you	11/21/2018 2:24 PM
3	Expected more detailed commentary from Martin on the state of the supply chain	11/21/2018 1:11 PM
4	Glad to see someone from outside energy looking at the supply chain	11/21/2018 12:26 PM

Q2 How engaging and useful did you find Slido?

Answered: 9 Skipped: 0

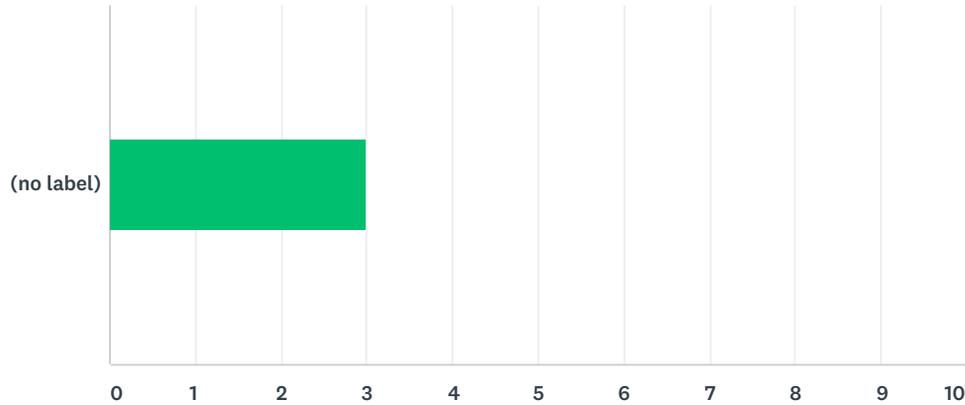


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	11.11% 1	11.11% 1	66.67% 6	11.11% 1	0.00% 0	9	2.78

#	ANY OTHER COMMENTS WELCOME	DATE
1	Had difficulties getting on-line.	11/21/2018 2:09 PM

Q3 How engaging and useful did you find the workshop sessions?

Answered: 9 Skipped: 0

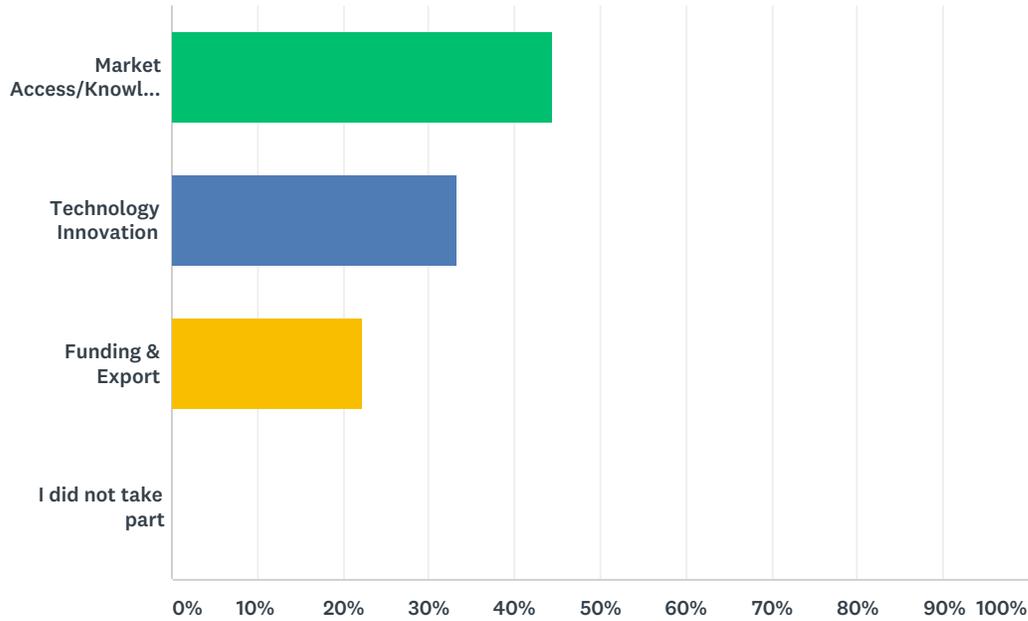


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	33.33% 3	33.33% 3	33.33% 3	0.00% 0	9	3.00

#	ANY OTHER COMMENTS WELCOME	DATE
1	It was useful to hear the information from the developer, but the format of the workshop could be made more effective. The information flowed mostly one way with suppliers listening to the developer. This was acknowledged by the Developer to his credit and my feeling was that many people in the room were new to the sector and wanted to hear as much information as possible about routes to market rather than expressing their lived experience at this stage. Facilitating the workshop would empower each one of the suppliers in the room as well as the developer to have their voice heard and for them to express their views by recording them on paper. The issues could be clustered and a SMART action plan created to identify who is responsible for tackling them, otherwise its just another talking shop and the developer / Tier 1 contractor is seen as just paying lip service to the process. The two way relationship needs to be based on effective communication and trust, but many suppliers don't believe anything will get done to improve the process because no one is accountable for the follow up or for delivering concrete actions. If our consortium at Bridge A Gap wins the Open4Business Supply Chain Portal tender for the Highlands & Islands, we will ensure that there is transparency and full accountability on all sides to reach a consensus about what can or can't be realistically achieved through a collaborative process, so that no one is left wondering who is prepared to provide their commitment to the improvement process. There are still many issues in the industry that haven't been resolved over the years, yet could be overcome by listening to people and someone taking the lead to ensure action is followed up. That wouldn't take much to achieve on a region-to-region basis with someone who is willing to go about the process in a thorough and systematic way to map all the industry issues then gain commitment from regional clusters to address them. My hope is to undertake that process for each area of the Highlands & Islands if we're successful in the tender.	11/21/2018 2:43 PM
2	TBH, I would have liked to have much longer and a 1to1 with Dan Finch for example	11/21/2018 2:24 PM
3	Great overview from Clark on the likely direction of travel for the Sector Deal. Highly relevant.	11/21/2018 1:11 PM

Q4 Which workshop session did you attend?

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES
Market Access/Knowledge	44.44% 4
Technology Innovation	33.33% 3
Funding & Export	22.22% 2
I did not take part	0.00% 0
TOTAL	9

Q5 What was your main takeaway from the workshop discussion you attended?

Answered: 9 Skipped: 0

#	RESPONSES	DATE
1	There is lots of opportunity and lots of help. Maybe too many places to help and not sure which one to try first.	11/21/2018 5:18 PM
2	That the evolution of a viable supply chain will take a commitment to developers, government and industry bodies and other stakeholders ensuring that collaborative working and engaging with local partners early in the project process is a requirement to bid. Incentives / legislative support is needed to ensure local companies are not left out of a competitive bidding process due to foreign tier one suppliers having no requirement to source locally. If it is done in other EU and global locations it should be done here too	11/21/2018 5:09 PM
3	Getting Developers to have some kind of demonstrator/test turbine as part of their CFD submission in order to support new technology in the sector.	11/21/2018 2:54 PM
4	See answer to Q3. What	11/21/2018 2:43 PM
5	Reinforcement of the colossal opportunity, however, not yet clear of an entry point for my organisation	11/21/2018 2:24 PM
6	Significant opportunities exists at both regional and national level for the supply chain.	11/21/2018 2:09 PM
7	Installation is an area that needs addressing in terms of reducing cost, risk, environmental impact.	11/21/2018 1:28 PM
8	Sector Deal is still a work in progress but looks promising. Collaboration is key and supply chain needs to accept that to secure work it must have capability and competitiveness.	11/21/2018 1:11 PM
9	operators dont do enough to help	11/21/2018 12:26 PM

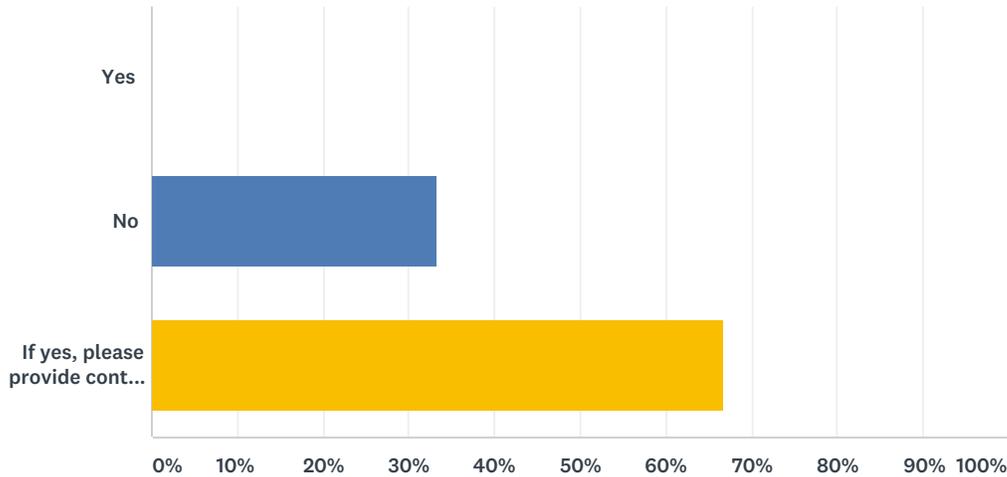
Q6 Do you have any general feedback or suggestions for future supply chain events?

Answered: 9 Skipped: 0

#	RESPONSES	DATE
1	Keep us informed about such events	11/21/2018 5:18 PM
2	Business to business matching would be good. Possibly a section on technical hackathons for sector problems, so similar to the workshops but focusing on a specific area	11/21/2018 5:09 PM
3	A meet & greet /121 with the developers would have been useful. Could maybe have been pre-organised as part of a workshop session possibly even dragons den style..	11/21/2018 2:54 PM
4	The supply chain events are an excellent idea and very welcome for the supply chain to engage with buyers. Well done and please keep up the good work to create more opportunities for people to express their views and have them formally recorded	11/21/2018 2:43 PM
5	A mechanism for a future 1 to 1 meeting with stakeholders. PS: just noticed Q7 + a Delegate List with contact details	11/21/2018 2:24 PM
6	Emphasise in ensuring all participants are hooked up to Slido	11/21/2018 2:09 PM
7	Encouraging the developers to speak with the SME's to promote cohesion between market positions would be useful.	11/21/2018 1:28 PM
8	Can we please have another session early in the New Year to have the Sector Deal presented along with an explanation of the detail and how it will underpin development and growth of the UK supply chain.	11/21/2018 1:11 PM
9	Opertors operators operators	11/21/2018 12:26 PM

Q7 Would you like to discuss anything further with any of the supply chain team?

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	33.33% 3
If yes, please provide contact details and a short summary of requested follow up,and we will be in touch.	66.67% 6
TOTAL	9

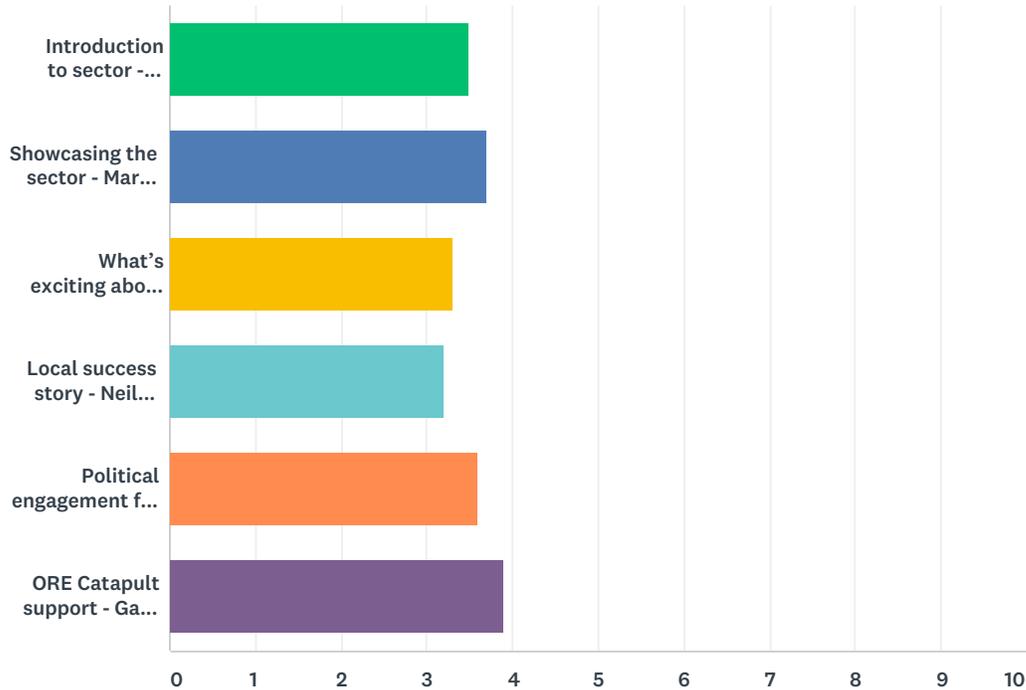
#	IF YES, PLEASE PROVIDE CONTACT DETAILS AND A SHORT SUMMARY OF REQUESTED FOLLOW UP,AND WE WILL BE IN TOUCH.	DATE
1	Points of contacts with major developers procurement functions.	11/21/2018 5:18 PM
2	If we are successful in our bid for the Highlands & Islands Open4Business supply chain portal, would you please come to the Moray Firth region where we can promote your engagement with a wide range of suppliers. Thanks for your support and we hope you have a successful roadshow around the country :D	11/21/2018 2:43 PM
3	Thomas Brian Donaldson Core Oil & Gas brian.donaldson@coreoilandgas.com 07799 418555 I would love to speak to Dan Finch and Richard Copeland of EPDR in particular and then others In General for Oil & Gas, Core come in between the layers of OEM's, Owners, Developers & Tier 1 Supply Chain. We are Engineering Consultants that usually act as the Owners Engineer, making sure we save money and never compromise on safety for the ownwer.Core has extensive offshore operational experience on brownfield installations worldwide and has supported the majority of North Sea greenfield start-ups over the last decade. + Our experience in upgrades and modifications including technical project management, interface management, technical assurance, commissioning and equipment optimisation has delivered high value to our clients by minimising delays in start-ups through the early identification of technical and compliance issues. Our services can be provided as part of a fully integrated project team or as a 3rd party independent service providing end user/client assurance	11/21/2018 2:24 PM
4	ONE _ Opportunity North East would like to engage with Clark MacFarlane (OWIC) to discuss how we might play a part in supporting economic development for the Oil & Gas supply chain community and in particular HUB development. ONE works in partnership with SE and other trade bodies focused in supporting regional economic growth and looking at supporting diversification via transferable skills and technologies from the Oil & Gas supply chain.	11/21/2018 2:09 PM

Offshore Wind Supply Chain Event - Aberdeen

5	I'd like to discuss the installation cost breakdown of a wind farm with Dan Finch from EDPR to determine where the most prevalent area's for innovation are required. Adrian Green adrian.green@zerozero.engineering	11/21/2018 1:28 PM
6	As above - further discussion on Sector Deal once it is agreed / announced.	11/21/2018 1:11 PM

Q1 How informative and useful did you find the following sessions?

Answered: 10 Skipped: 0

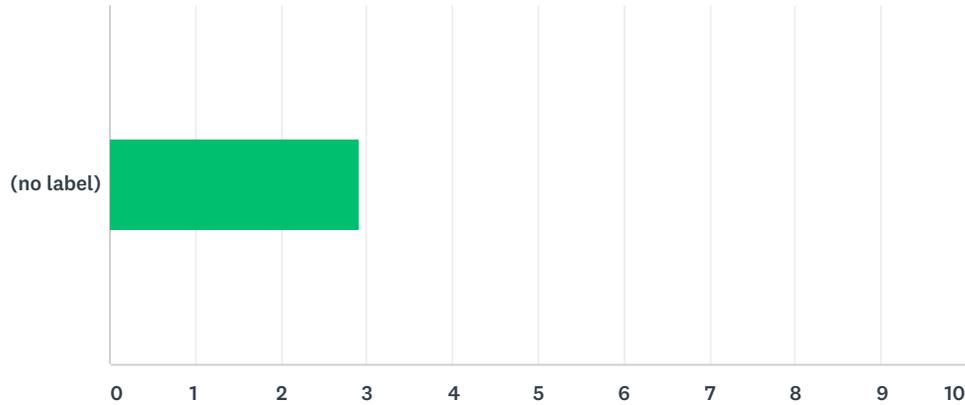


	NOT USEFUL	QUITE USEFUL	USEFUL	VERY USEFUL	I DID NOT ATTEND THESE SESSIONS	TOTAL	WEIGHTED AVERAGE
Introduction to sector - Clark MacFarlane, OWIC	0.00% 0	0.00% 0	50.00% 5	50.00% 5	0.00% 0	10	3.50
Showcasing the sector - Martin Whitmarsh and team	0.00% 0	0.00% 0	30.00% 3	70.00% 7	0.00% 0	10	3.70
What's exciting about being the region? Mary Thorogood, MHI Vestas	0.00% 0	10.00% 1	50.00% 5	40.00% 4	0.00% 0	10	3.30
Local success story - Neil Pittam, Searoc	0.00% 0	20.00% 2	40.00% 4	40.00% 4	0.00% 0	10	3.20
Political engagement for supply chain - Marina Valls, Renewable UK	0.00% 0	10.00% 1	30.00% 3	50.00% 5	10.00% 1	10	3.60
ORE Catapult support - Gavin Smart, ORE Catapult	0.00% 0	0.00% 0	10.00% 1	90.00% 9	0.00% 0	10	3.90

#	ANY COMMENTS ON THESE SESSIONS WELCOME	DATE
1	Excellent format, engaging and focussed speakers.	11/26/2018 3:27 PM
2	The presentation by developers/OEMs should focus on the potential for clusters more than what the company does / has achieved.	11/26/2018 10:57 AM
3	The presentations were delivered by and large in a fun and relaxed atmosphere with real enthusiasm. Very informative and open.	11/23/2018 9:11 AM

Q2 How engaging and useful did you find Slido?

Answered: 10 Skipped: 0

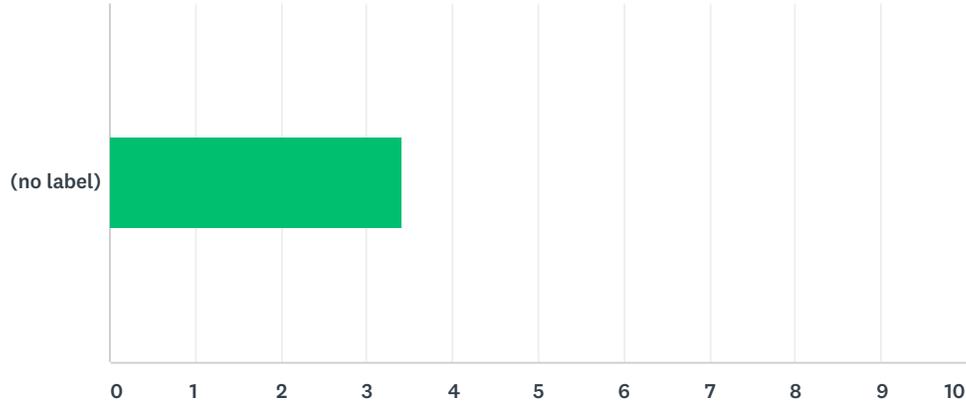


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	30.00% 3	50.00% 5	20.00% 2	0.00% 0	10	2.90

#	ANY OTHER COMMENTS WELCOME	DATE
1	Its a very good tool at events and I think it adds a voice of the audience quickly and efficiently and maximises participation.	11/26/2018 3:27 PM
2	Good way to get people to ask questions / vote - although should be taken for what it is i.e. a snap shot of views of those in the room at the time only.	11/26/2018 10:57 AM
3	First time I've ever tried this and it worked really well. A great way of getting interact and quick feedback from the group.	11/23/2018 9:11 AM

Q3 How engaging and useful did you find the workshop sessions?

Answered: 10 Skipped: 0

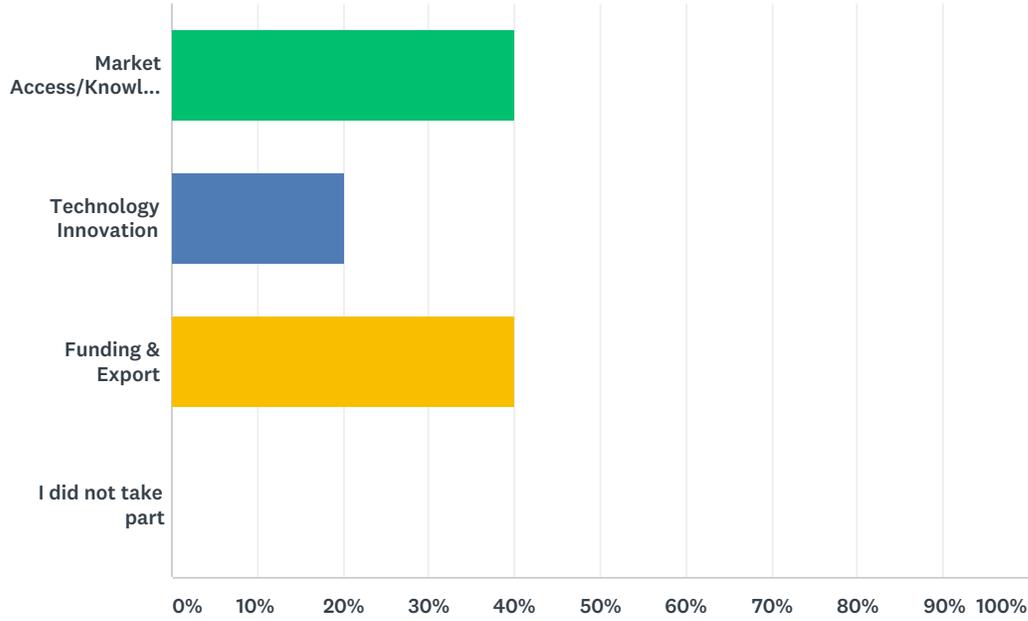


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	60.00% 6	40.00% 4	0.00% 0	10	3.40

#	ANY OTHER COMMENTS WELCOME	DATE
1	I couldn't stay for the full session but good discussion points on the table I joined and let well by John Best.	11/26/2018 10:57 AM
2	One company dominated the meeting for a while but it was still interesting. The group were very supportive and came up with offers of help and avenues to explore. A great way of getting time with people who can really make a difference.	11/23/2018 9:11 AM

Q4 Which workshop session did you attend?

Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Market Access/Knowledge	40.00%	4
Technology Innovation	20.00%	2
Funding & Export	40.00%	4
I did not take part	0.00%	0
TOTAL		10

Q5 What was your main takeaway from the workshop discussion you attended?

Answered: 10 Skipped: 0

#	RESPONSES	DATE
1	Need for a framework or process to be put in place to attract awareness and provide opportunities for SME's to play a role in offshore wind energy. Developers, owners and Government want SME's to engage; SME's want to participate but there is no process in the middle to make this happen.	11/26/2018 6:15 PM
2	The hardest part, is accessing the right people within an organisation or department to be able to progress forward.	11/26/2018 4:21 PM
3	Active player in floating wind	11/26/2018 3:40 PM
4	That funding and backing of entrepreneurial ideas is a more pressing issue than finding export markets. We need to find a process for supporting viable ideas in the UK before they are lost to competitors.	11/26/2018 3:27 PM
5	More could be done collaboratively / in a more coordinated way (where possible, bearing in mind competition law) to highlight the opportunities for suppliers and for suppliers to register their interest. Could DIT / Renewable UK or other provide a more centralised list that doesn't require yet another subscription fee for SMEs?	11/26/2018 10:57 AM
6	The industry seems very segmented.	11/26/2018 10:31 AM
7	.	11/23/2018 2:12 PM
8	Funding is out there but you really have to have all the answers ready so there is virtually zero risk	11/23/2018 10:16 AM
9	Concern that floating won't take off in the UK even though it could be a great export to countries that will need it. That the industry might no longer be interested in disruptive technologies as it becomes established.	11/23/2018 9:17 AM
10	What to do next in terms of getting hold of the information we need to tailor our products better to this market and who makes the decisions.	11/23/2018 9:11 AM

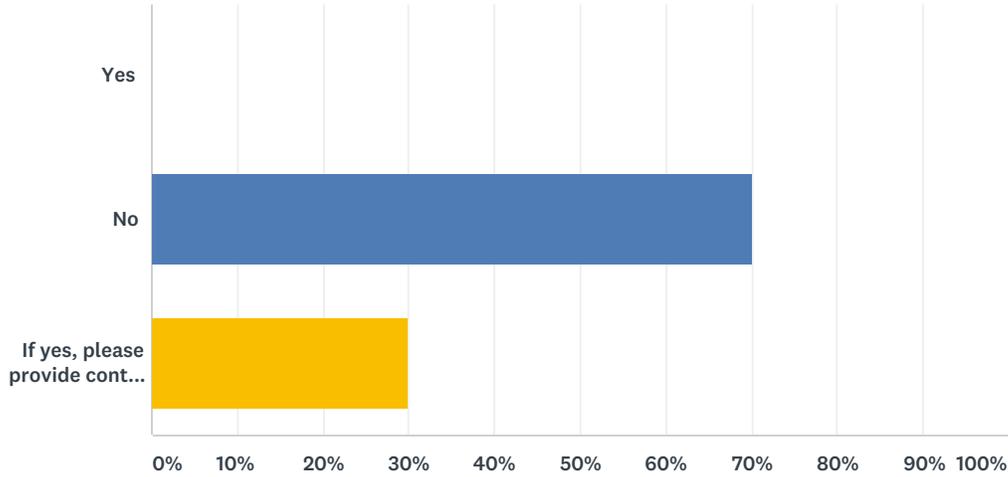
Q6 Do you have any general feedback or suggestions for future supply chain events?

Answered: 10 Skipped: 0

#	RESPONSES	DATE
1	More interaction on how SME's can engage in projects - ie. those SME's that have been successful - how did they achieve this?; how Tier 1 suppliers can play an engagement role with SME's? How SME's successes are communicated and promoted to show best-practice interaction?	11/26/2018 6:15 PM
2	N/A	11/26/2018 4:21 PM
3	What services required by tier-1's? what is offered by attendees ?	11/26/2018 3:40 PM
4	Very impressed and would like to help promote future events of this type to UK supply chain and government representatives, with plenty of notice.	11/26/2018 3:27 PM
5	Really useful event both in terms of networking and content.	11/26/2018 10:57 AM
6	No	11/26/2018 10:31 AM
7	.	11/23/2018 2:12 PM
8	On the whole very good but would like to see more on how large scale disruptive technologies can work their way into the industry	11/23/2018 10:16 AM
9	More detailed case studies of SMEs that are in the supply chain and how they achieved it - the positives and negatives of their experiences.	11/23/2018 9:17 AM
10	Perhaps publish the list of who is expected to be attending in advance but that is really all.	11/23/2018 9:11 AM

Q7 Would you like to discuss anything further with any of the supply chain team?

Answered: 10 Skipped: 0

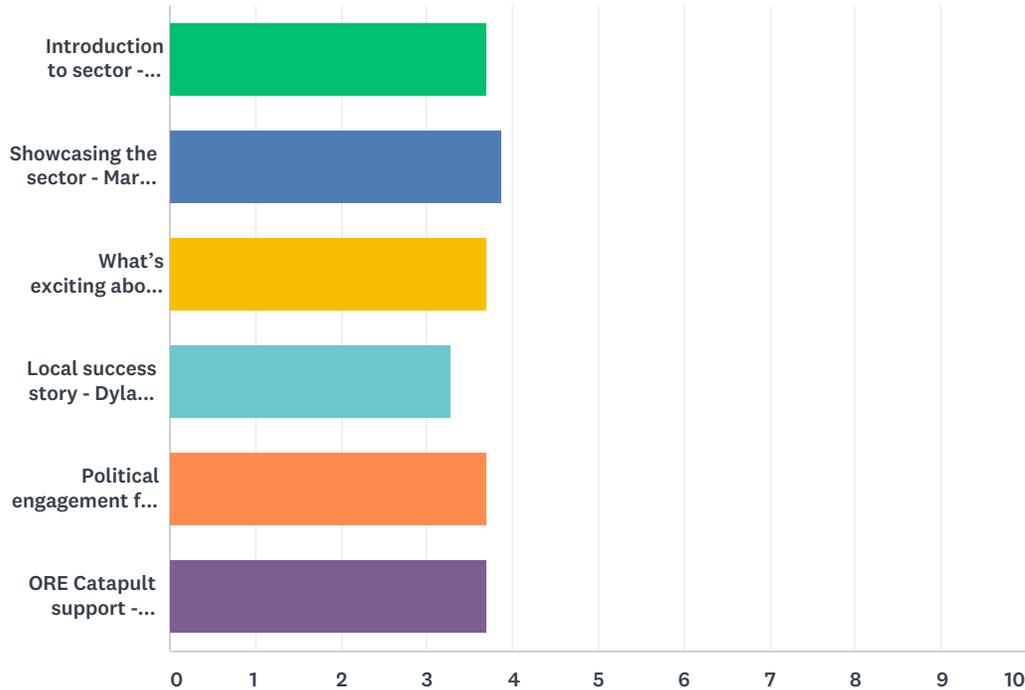


ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	70.00% 7
If yes, please provide contact details and a short summary of requested follow up, and we will be in touch.	30.00% 3
TOTAL	10

#	IF YES, PLEASE PROVIDE CONTACT DETAILS AND A SHORT SUMMARY OF REQUESTED FOLLOW UP, AND WE WILL BE IN TOUCH.	DATE
1	More interaction on how SME's can engage in projects - ie. those SME's that have been successful - how did they achieve this?; how Tier 1 suppliers can play an engagement role with SME's? How SME's successes are communicated and promoted to show best-practice interaction? Having worked for a FTSE 20 company (National Grid) in UK and USA for many years on major infrastructure projects and now a comms consultant, I have experience on both sides and feel there is a big gap between the aspirations of developers and owners in wanting to attract SME's and the reality of SME's actually being involved or having opportunities to become involved. Happy to discuss this further. Clive Hawkins clive.hawkins@highbankcommunications.com	11/26/2018 6:15 PM
2	Very keen to work with ORE Catapult to optimise our support for UK OW companies. Jamie Cribb Trade Manager - Offshore Wind jamie.cribb@trade.gov.uk 07471 021 596	11/26/2018 3:27 PM
3	Some people will be coming back with more information which is excellent. No immediate need until we have seen this.	11/23/2018 9:11 AM

Q1 How informative and useful did you find the following sessions?

Answered: 7 Skipped: 0

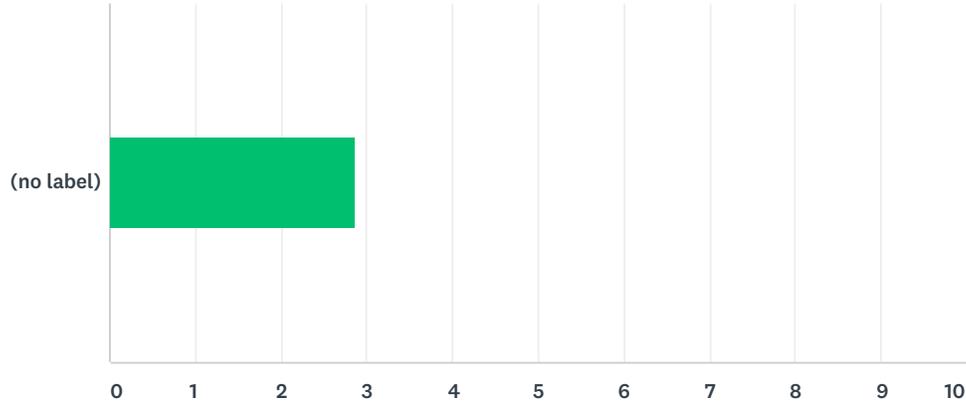


	NOT USEFUL	QUITE USEFUL	USEFUL	VERY USEFUL	I DID NOT ATTEND THESE SESSIONS	TOTAL	WEIGHTED AVERAGE
Introduction to sector - Benj Sykes, OWIC	0.00% 0	0.00% 0	28.57% 2	71.43% 5	0.00% 0	7	3.71
Showcasing the sector - Martin Whitmarsh and Claire Canning	0.00% 0	0.00% 0	14.29% 1	85.71% 6	0.00% 0	7	3.86
What's exciting about being the region? Alistair Gill, Innogy	0.00% 0	0.00% 0	28.57% 2	71.43% 5	0.00% 0	7	3.71
Local success story - Dylan Jones, Turbine Transfers Ltd	0.00% 0	14.29% 1	42.86% 3	42.86% 3	0.00% 0	7	3.29
Political engagement for supply chain - Oankar Birdi, Renewable UK	0.00% 0	0.00% 0	28.57% 2	71.43% 5	0.00% 0	7	3.71
ORE Catapult support - Stuart Barnes, ORE Catapult	0.00% 0	0.00% 0	28.57% 2	71.43% 5	0.00% 0	7	3.71

#	ANY COMMENTS ON THESE SESSIONS WELCOME	DATE
1	Nothing wrong with the local success, but it is long way down the supply from my sector, interesting but not my area	11/29/2018 3:10 PM
2	really informative event, and break out sessions were great, it was so unusual to be able to ask direct questions to the industry	11/29/2018 3:03 PM
3	Useful insight into the sector and forecast growth - was curious that no mention of Brexit and the potential impact this may have on the future and investment (conscious that it's an unknown but it seemed like the elephant in the room). Didn't detract from the information or presentation, but an observation none-the-less...	11/28/2018 11:50 AM

Q2 How engaging and useful did you find Slido?

Answered: 7 Skipped: 0

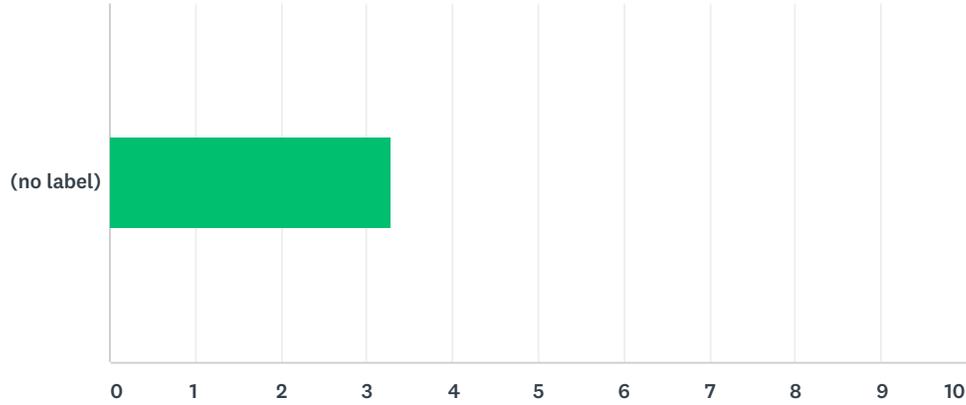


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	42.86% 3	42.86% 3	0.00% 0	14.29% 1	7	2.86

#	ANY OTHER COMMENTS WELCOME	DATE
1	Found the poll questions closed while I was completing my response (shortly after being encouraged to engage with poll 3 &4) so may be a timing issue?	11/28/2018 11:50 AM

Q3 How engaging and useful did you find the workshop sessions?

Answered: 7 Skipped: 0

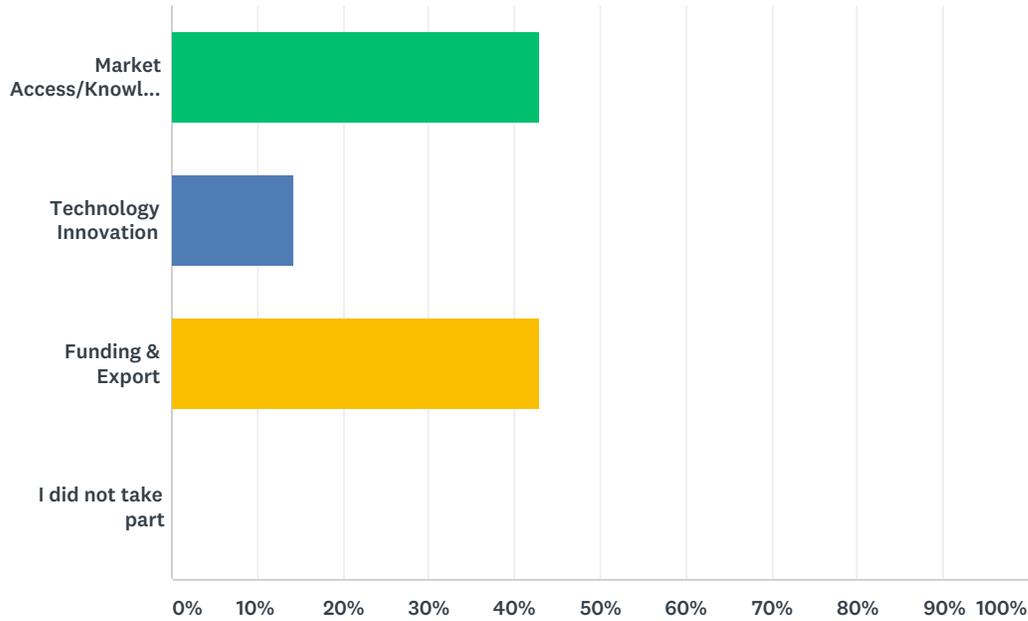


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	71.43% 5	28.57% 2	0.00% 0	7	3.29

#	ANY OTHER COMMENTS WELCOME	DATE
1	The event was very informative and we really appreciated these sessions as it gave a fantastic opportunity to discuss where and how we could reach support to grow within the sector. Fantastic idea.	12/12/2018 11:44 AM
2	Useful to hear the insight about market entry/opportunities and how to access procurement opportunities. Very interested in the formation of the Cluster, and if there are any opportunities to 'partner' with OWIC in a commercial capacity - please keep me informed.	11/28/2018 11:50 AM

Q4 Which workshop session did you attend?

Answered: 7 Skipped: 0



ANSWER CHOICES	RESPONSES	
Market Access/Knowledge	42.86%	3
Technology Innovation	14.29%	1
Funding & Export	42.86%	3
I did not take part	0.00%	0
TOTAL		7

Q5 What was your main takeaway from the workshop discussion you attended?

Answered: 7 Skipped: 0

#	RESPONSES	DATE
1	We attended Funding & Export, but also discussed Market Access/Knowledge. Benj Sykes has passed our contact details on to the correct person in their supply chain and we have been contacted to go through our innovative cost saving solutions for component parts.	12/12/2018 11:44 AM
2	the potential growth in the coming years	12/4/2018 8:13 AM
3	Developers and Tier 1 companies need to make their requirements and challenges more visible. The region would be more successful in drawing in funding and investment if it works as a cluster.	11/29/2018 5:29 PM
4	the diversity present.	11/29/2018 3:10 PM
5	ideas on how to access the market, and to go for international market - USA its a big project for us next year, its confirmed our plan for this growth area	11/29/2018 3:03 PM
6	Interest in developing a local North Wales and north west cluster	11/28/2018 11:54 AM
7	Procurement routes, awareness-raising opportunities, insight from Alistair and Oankar was very helpful. General discussion around the table was informative and interesting.	11/28/2018 11:50 AM

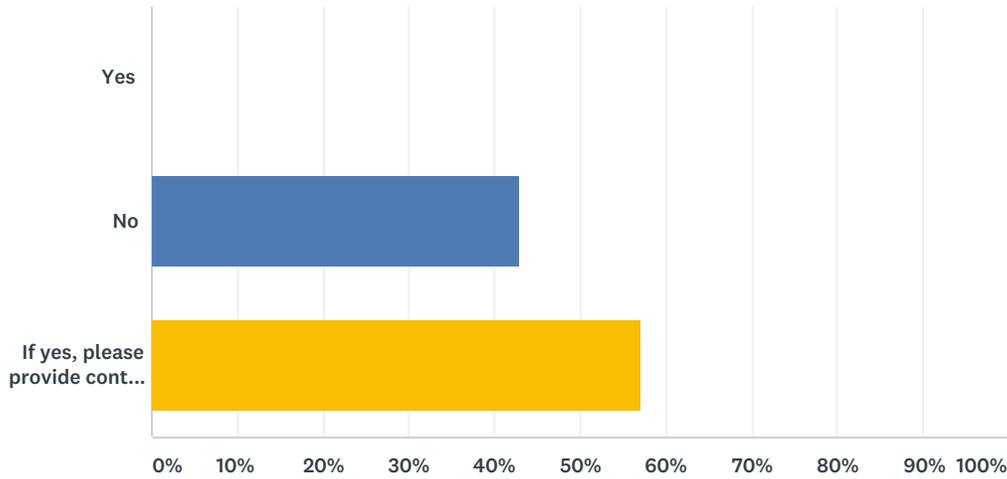
Q6 Do you have any general feedback or suggestions for future supply chain events?

Answered: 7 Skipped: 0

#	RESPONSES	DATE
1	Great location and hospitality, good mix of speakers and fantastic workshop sessions - perhaps attendees could pick more than one?	12/12/2018 11:44 AM
2	No	12/4/2018 8:13 AM
3	No	11/29/2018 5:29 PM
4	no, the event was well run.	11/29/2018 3:10 PM
5	the event was really well hosted, and put together, great venue and it was great we got to network as much as we did with the key speakers, that normally does not happen	11/29/2018 3:03 PM
6	It was shame a local LEP or Welsh Government did not speak or attend	11/28/2018 11:54 AM
7	Great venue, location, room - catering looked lovely but I didn't eat. Perhaps more 'success stories'. I thought the breaks were long, and if condensed could have allowed for networking before the scheduled event end, especially useful for those unable to stay for drinks/networking afterwards. Perhaps a round-room introduction, or a delegate list on arrival/table would have been useful to kick-start networking (tables tended to stick together). Otherwise a really good, informative, useful and valuable event - it was just a shame the attendance was low. Thanks for sending the slides and delegate list through this morning. Perhaps look to other sectors for learnings/collaboration/thought leadership - conscious that there are complexities in transferring all skills but there are principles which can be useful (cf Martin's involvement as a newcomer to the sector)...	11/28/2018 11:50 AM

Q7 Would you like to discuss anything further with any of the supply chain team?

Answered: 7 Skipped: 0

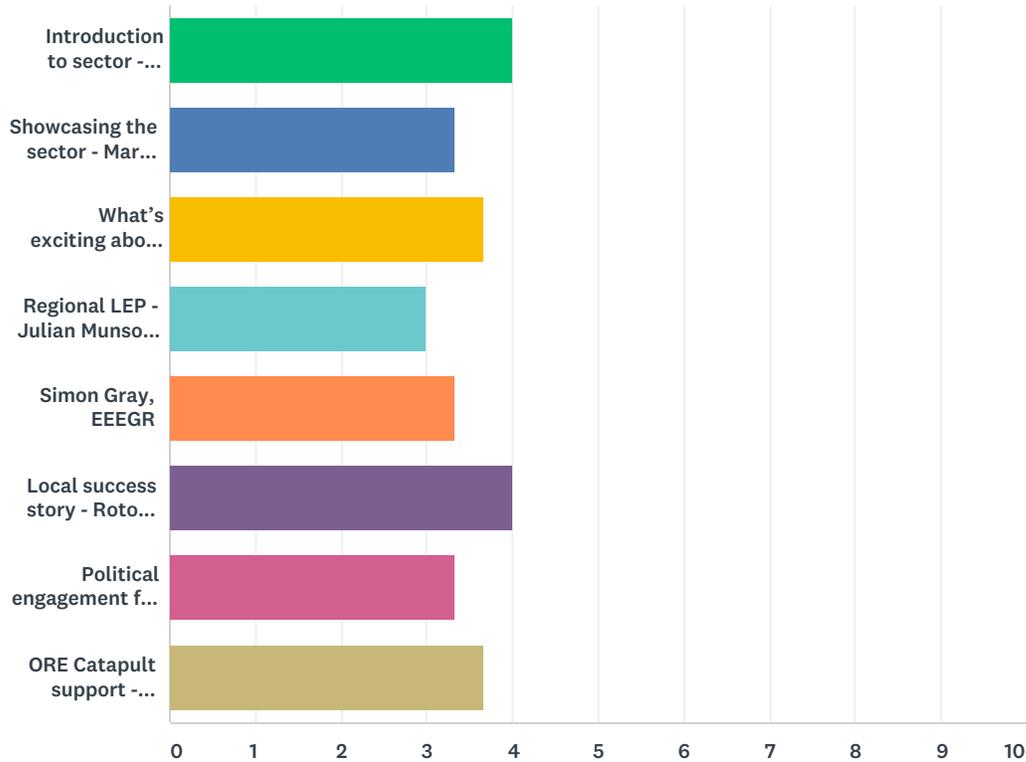


ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	42.86% 3
If yes, please provide contact details and a short summary of requested follow up,and we will be in touch.	57.14% 4
TOTAL	7

#	IF YES, PLEASE PROVIDE CONTACT DETAILS AND A SHORT SUMMARY OF REQUESTED FOLLOW UP,AND WE WILL BE IN TOUCH.	DATE
1	I passed my contact details over to check if we could be added to the supplier list, can you confirm if this is now live and how to access it please? many thanks Stacey stacey@workplace-worksafe.co.uk 07741 146 569	12/12/2018 11:44 AM
2	Looking at local content targets for upto 60% by 2030. What will be done to extend this target beyond tier 1? & as its global export market, we must ensure UK OEM's are comparing like for like with their suppliers? and that legislative obligations for EH&S compliance are considered globally. Does China have the same E H&S obligations as EU? m.hudson@negeurope.com	11/29/2018 3:10 PM
3	More discussion on what support can be given from the Sector Deal for cluster development in NWNW	11/28/2018 11:54 AM
4	Development of the Cluster and opportunities to speak at events - I run my own business developing and delivering stakeholder engagement and communications for the infrastructure, property and built environment sectors - including energy projects (as the anchor element or within a mixed-use development). My network also includes education partners OWIC may benefit from being introduced to... I can be reached on ruth@resultscommunications.co.uk and via 0333 200 2609. Many thanks	11/28/2018 11:50 AM

Q1 How informative and useful did you find the following sessions?

Answered: 3 Skipped: 0

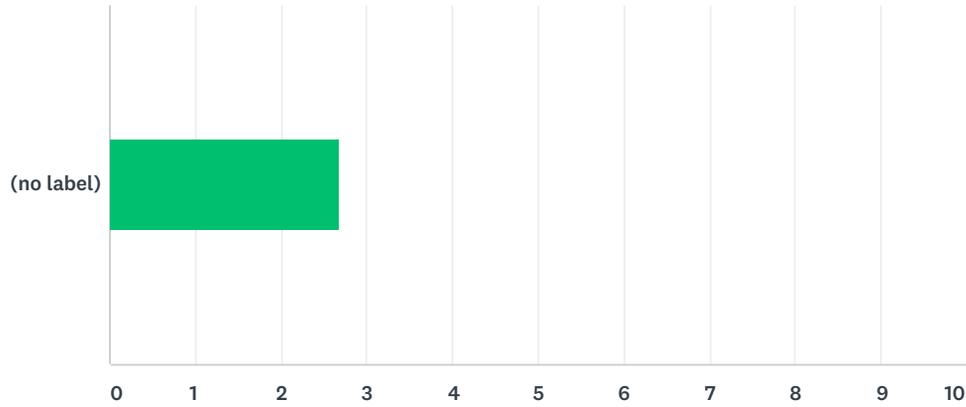


	NOT USEFUL	QUITE USEFUL	USEFUL	VERY USEFUL	I DID NOT ATTEND THESE SESSIONS	TOTAL	WEIGHTED AVERAGE
Introduction to sector - Clark MacFarlane, OWIC	0.00% 0	0.00% 0	0.00% 0	100.00% 3	0.00% 0	3	4.00
Showcasing the sector - Martin Whitmarsh and Claire Canning	0.00% 0	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	3.33
What's exciting about being the region? Andy Paine, Vattenfall	0.00% 0	0.00% 0	33.33% 1	66.67% 2	0.00% 0	3	3.67
Regional LEP - Julian Munson, New Anglia LEP	0.00% 0	0.00% 0	100.00% 3	0.00% 0	0.00% 0	3	3.00
Simon Gray, EEEGR	0.00% 0	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	3.33
Local success story - Rotos 360 Ltd	0.00% 0	0.00% 0	0.00% 0	100.00% 3	0.00% 0	3	4.00
Political engagement for supply chain - Barnaby Wharton, Renewable UK	0.00% 0	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	3.33
ORE Catapult support - Stuart Barnes, ORE Catapult	0.00% 0	0.00% 0	33.33% 1	66.67% 2	0.00% 0	3	3.67

#	ANY COMMENTS ON THESE SESSIONS WELCOME	DATE
1		12/12/2018 9:02 AM

Q2 How engaging and useful did you find Slido?

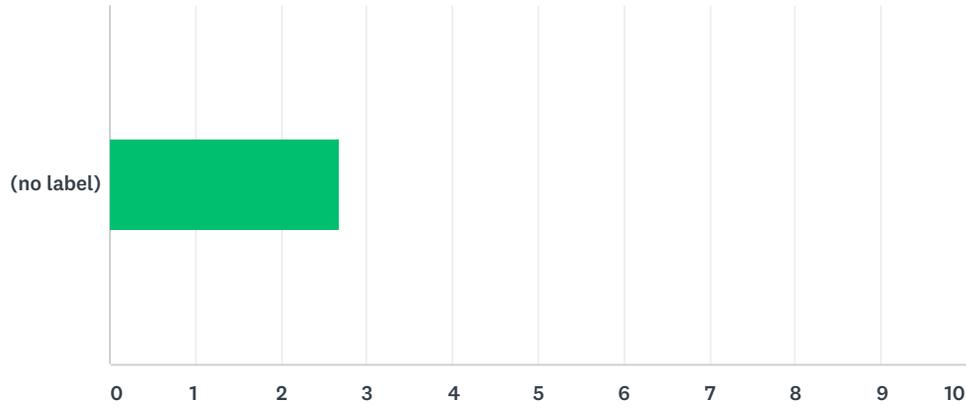
Answered: 3 Skipped: 0



	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	66.67% 2	0.00% 0	33.33% 1	0.00% 0	3	2.67

Q3 How engaging and useful did you find the workshop sessions?

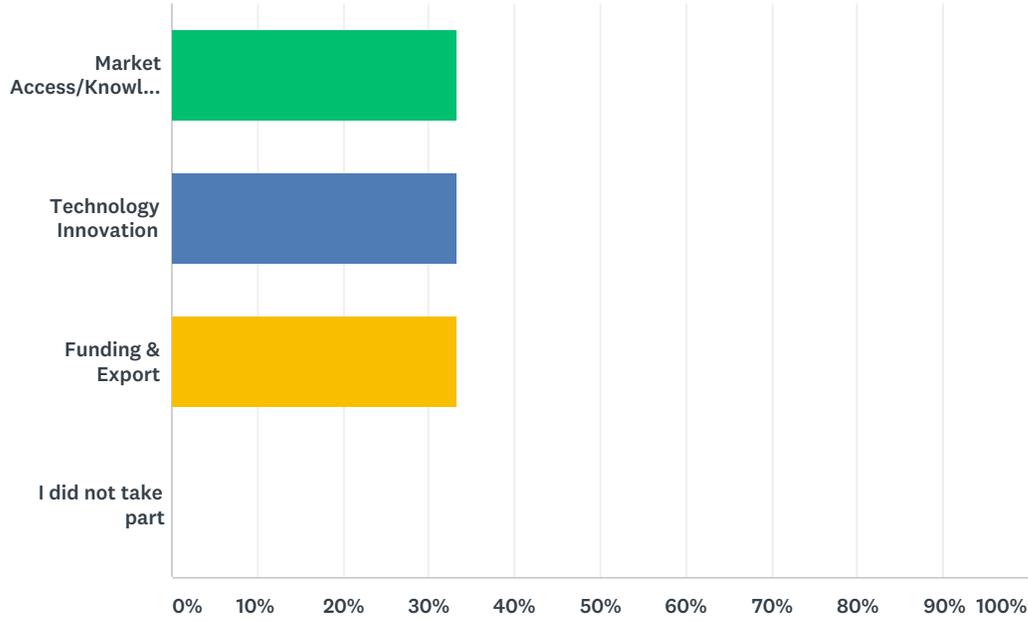
Answered: 3 Skipped: 0



	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	66.67% 2	0.00% 0	33.33% 1	0.00% 0	3	2.67

Q4 Which workshop session did you attend?

Answered: 3 Skipped: 0



ANSWER CHOICES	RESPONSES	
Market Access/Knowledge	33.33%	1
Technology Innovation	33.33%	1
Funding & Export	33.33%	1
I did not take part	0.00%	0
TOTAL		3

Q5 What was your main takeaway from the workshop discussion you attended?

Answered: 3 Skipped: 0

#	RESPONSES	DATE
1	The difficulty local businesses are faced with getting involved in the supply chain with large projects on the East Coast.	12/13/2018 8:23 AM
2	That the companies within our region are not very high profile, yet have a lot to offer!	12/12/2018 9:02 AM
3	It was a small session so I was able to ask many questions and get into the detail.	12/12/2018 6:38 AM

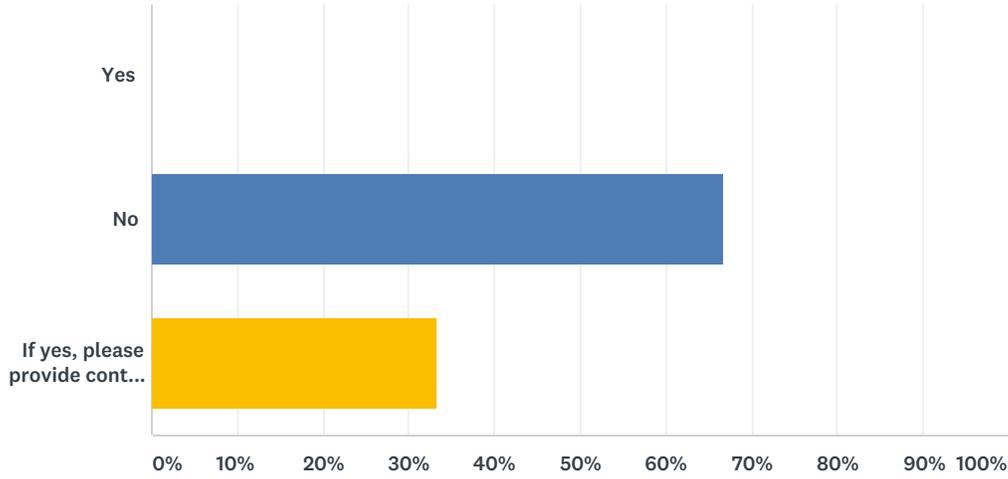
Q6 Do you have any general feedback or suggestions for future supply chain events?

Answered: 3 Skipped: 0

#	RESPONSES	DATE
1	The East of England Offshore Wind Skills Centre has been created in Great Yarmouth to upskill local people, there is local knowledge of this but perhaps this could be highlighted at further events https://www.linkedin.com/company/east-of-england-offshore-wind-skills-centre/	12/13/2018 8:23 AM
2	More emphasis on developing the East Anglian cluster being the most developed area for windfarm activity it is the least represented.	12/12/2018 9:02 AM
3	Ore examples of what the opportunities are and how we can tender for them.	12/12/2018 6:38 AM

Q7 Would you like to discuss anything further with any of the supply chain team?

Answered: 3 Skipped: 0

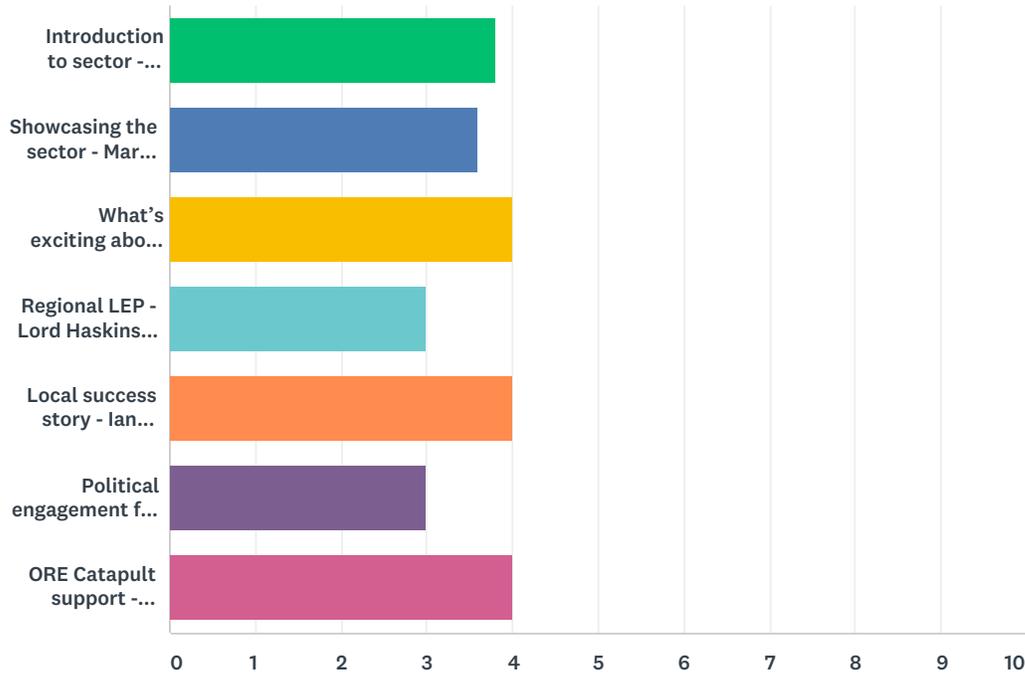


ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	66.67% 2
If yes, please provide contact details and a short summary of requested follow up,and we will be in touch.	33.33% 1
TOTAL	3

#	IF YES, PLEASE PROVIDE CONTACT DETAILS AND A SHORT SUMMARY OF REQUESTED FOLLOW UP,AND WE WILL BE IN TOUCH.	DATE
1	Finding out at what points within the process third party verification and inspection organisations are engaged. Are there plans for more supplier events to be arranged locally! Graham Manning - Inspection Verification Bureau Limited. E-mail: graham.manning@ivbltd.co.uk	12/12/2018 9:02 AM

Q1 How informative and useful did you find the following sessions?

Answered: 5 Skipped: 0

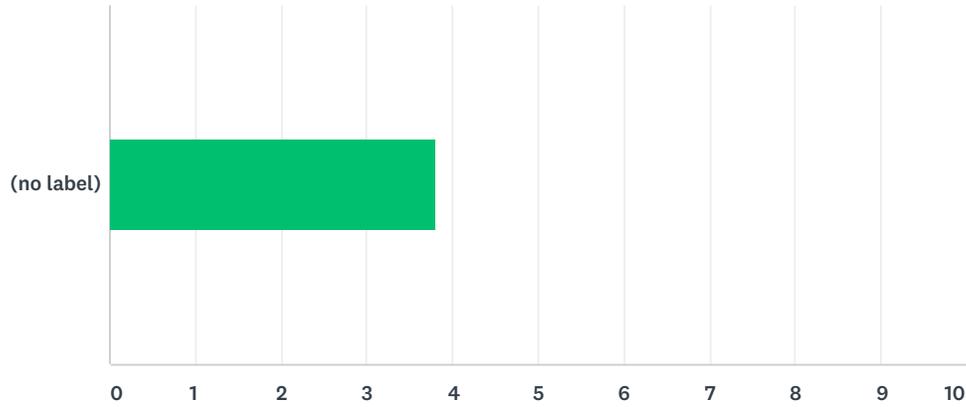


	NOT USEFUL	QUITE USEFUL	USEFUL	VERY USEFUL	I DID NOT ATTEND THESE SESSIONS	TOTAL	WEIGHTED AVERAGE
Introduction to sector - Clark MacFarlane, OWIC	0.00% 0	0.00% 0	20.00% 1	80.00% 4	0.00% 0	5	3.80
Showcasing the sector - Martin Whitmarsh and Claire Canning	0.00% 0	0.00% 0	40.00% 2	60.00% 3	0.00% 0	5	3.60
What's exciting about being the region? Matthew Wright, ORSTED	0.00% 0	0.00% 0	0.00% 0	100.00% 5	0.00% 0	5	4.00
Regional LEP - Lord Haskins, Humber LEP	0.00% 0	20.00% 1	60.00% 3	20.00% 1	0.00% 0	5	3.00
Local success story - Ian Coates, SMC	0.00% 0	0.00% 0	0.00% 0	100.00% 5	0.00% 0	5	4.00
Political engagement for supply chain - Bahzad Ayoub, Renewable UK	0.00% 0	0.00% 0	100.00% 5	0.00% 0	0.00% 0	5	3.00
ORE Catapult support - Stuart Barnes, ORE Catapult	0.00% 0	0.00% 0	0.00% 0	100.00% 5	0.00% 0	5	4.00

#	ANY COMMENTS ON THESE SESSIONS WELCOME	DATE
1	With the exception of Ian Coates it was very Tier One focused	12/12/2018 11:59 AM
2	Encouraging to see so many new entrants	12/11/2018 8:25 PM

Q2 How engaging and useful did you find Slido?

Answered: 5 Skipped: 0

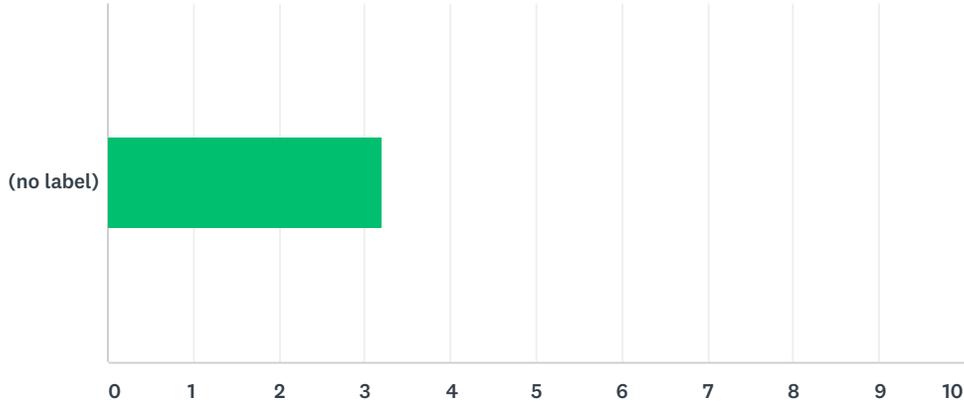


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	40.00% 2	40.00% 2	20.00% 1	5	3.80

#	ANY OTHER COMMENTS WELCOME	DATE
1	DIT Government Phones don't play!	12/12/2018 11:59 AM

Q3 How engaging and useful did you find the workshop sessions?

Answered: 5 Skipped: 0

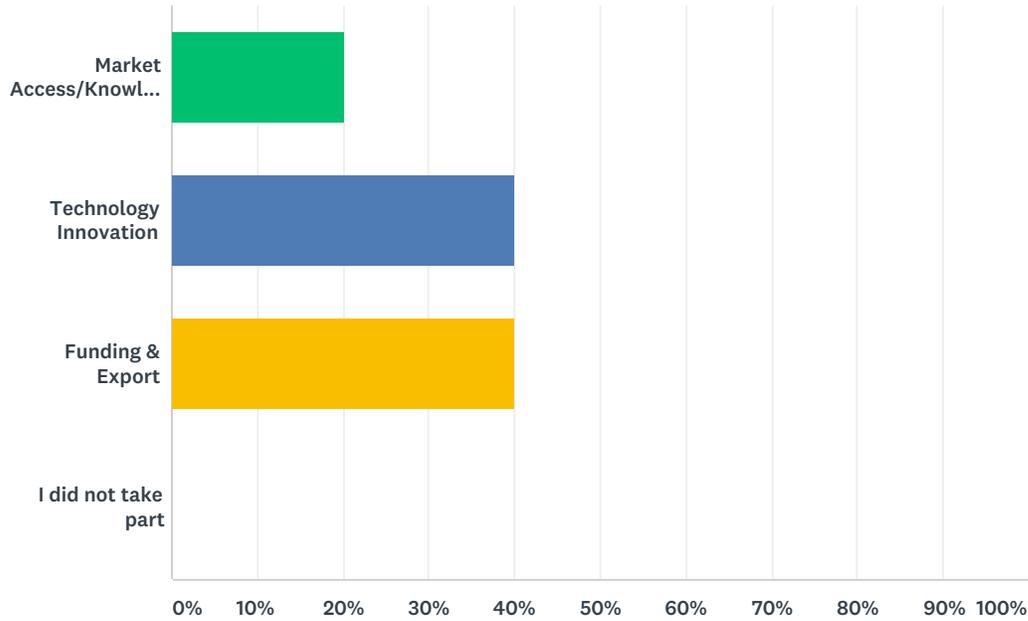


	NOT ENGAGING	QUITE ENGAGING	VERY ENGAGING	EXTREMELY ENGAGING	I DID NOT USE IT	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	40.00% 2	0.00% 0	60.00% 3	0.00% 0	5	3.20

#	ANY OTHER COMMENTS WELCOME	DATE
1	The discussions was very Tier One focused again. Smaller SME's are excluded from your sector if they don't have industry accreditation's stipulated by the likes of Siemens and Orsted and I believe you should be looking at ways to open up to these companies who are the future Siemens and Orsted's!	12/12/2018 11:59 AM

Q4 Which workshop session did you attend?

Answered: 5 Skipped: 0



ANSWER CHOICES	RESPONSES	
Market Access/Knowledge	20.00%	1
Technology Innovation	40.00%	2
Funding & Export	40.00%	2
I did not take part	0.00%	0
TOTAL		5

Q5 What was your main takeaway from the workshop discussion you attended?

Answered: 5 Skipped: 0

#	RESPONSES	DATE
1	Action needed in this area, utilising the business support available through the Aura team at the University of Hull and the Aura Innovation Centre when the facility opens	12/13/2018 4:34 PM
2	There was little or no encouragement for none Tier One companies to supply the sector.	12/12/2018 11:59 AM
3	Other supply chain companies have had success and it was good to learn how they managed it.	12/12/2018 6:36 AM
4	Realistic	12/11/2018 8:25 PM
5	That it is important to meet people by attending lots of events and conferences. To identify organisations already in the supply chain and working with Tier 1 organisations and partner with them.	12/11/2018 6:02 PM

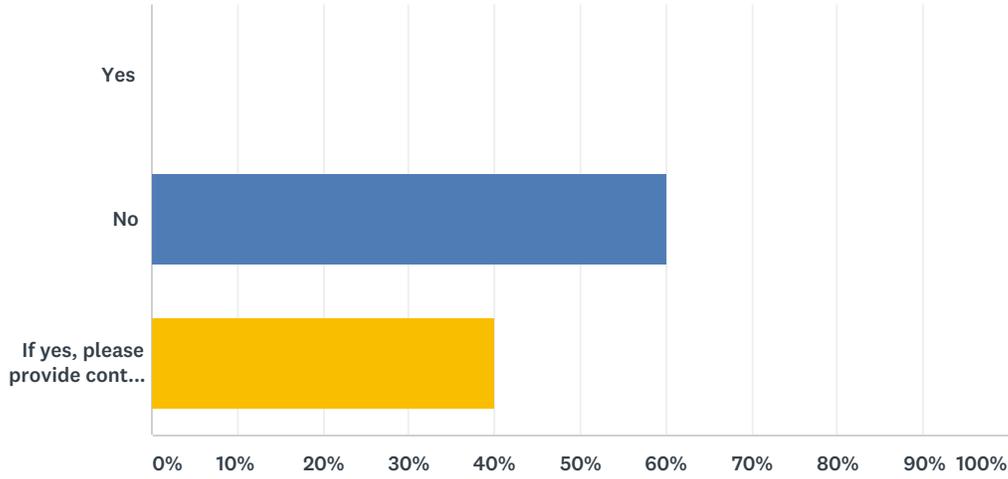
Q6 Do you have any general feedback or suggestions for future supply chain events?

Answered: 5 Skipped: 0

#	RESPONSES	DATE
1	Thanks for arranging the event. Further interaction with Aura	12/13/2018 4:34 PM
2	Perhaps not a point for future events but an overall comment that as I work for DIT and am looking to help businesses export I find the whole sector groups which have developed to be very difficult to work with as your sector has no main industry organisation and whilst I work very well with THMA there are to many organisations all replicating effort	12/12/2018 11:59 AM
3	Bring the procurement people along.	12/12/2018 6:36 AM
4	Great idea. More of them would be welcome especially North West	12/11/2018 8:25 PM
5	The workshop style discussions seemed to work very well. Having real 'case studies' present to provide summaries of their experiences is useful. More events will be needed to help develop links and relationships.	12/11/2018 6:02 PM

Q7 Would you like to discuss anything further with any of the supply chain team?

Answered: 5 Skipped: 0



ANSWER CHOICES	RESPONSES
Yes	0.00% 0
No	60.00% 3
If yes, please provide contact details and a short summary of requested follow up,and we will be in touch.	40.00% 2
TOTAL	5

#	IF YES, PLEASE PROVIDE CONTACT DETAILS AND A SHORT SUMMARY OF REQUESTED FOLLOW UP,AND WE WILL BE IN TOUCH.	DATE
1	I and I'm sure my colleagues in London are keen to discuss at all time developing exports across your sector	12/12/2018 11:59 AM
2	How can I help Charley@charleyrattan.co.uk	12/11/2018 8:25 PM