



MORAY EAST

OFFSHORE WIND FARM



Moray Offshore Windfarm (East) Limited

Supply Chain Plan

Main Document



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Executive Summary

In March 2014, Moray East became the first Round 3 developer to achieve consent for 1,116MW of offshore wind generation in the outer Moray Firth. The Moray East Project is a golden opportunity for offshore wind; opening new, deeper water areas of the sea to development globally, bringing with it new markets and a highly skilled, competitive and innovative industrial base.

Moray East's competitive contracting strategy is driven by EDPR's requirement to compete in international markets on price; multiple competent suppliers in competition, which are driven to innovate, are vital for cost reduction. Beginning in 2010, Moray East has worked to identify established suppliers and new entrants at all levels in the supply chain and has worked with agencies such as SE, HIE, BEIS and DIT to enable suppliers to access Government support intended to assist their entry into the offshore wind market. Not only has this seen new entrants (e.g. Drace and Global Energy), Moray East's EPCI approach has also spurred the establishment of new joint ventures with broad-ranging capabilities.

In response to Moray East's work with the supply chain, Paul Wheelhouse MSP, Minister for Business, Innovation & Energy said:

"The Moray Offshore Wind Project team has worked tirelessly with both the existing and potential offshore wind supply chain. They have encouraged new entrants through driving active engagement by preferred Tier one suppliers. They help UK companies reflect upon their strategies and contract offers to ensure that they are as competitive as possible in the UK and to help them in opening up potential export opportunities in their International projects."

Moray East has also driven innovation within the supply chain, including the deployment of a novel Gravity Base Structure to support the meteorological mast. Such innovation has been used to the benefit of the wider offshore renewables industry. For example, the use of the gravity base in the Moray East Project inspired the Gravi3 project; an EU funded research partnership aimed at reducing risks and complexity associated with substructures, which will ultimately contribute to reducing the levelised cost of energy.

Overall, to realise Moray East's potential, diversification and a new skill-set are also required. Moray East has identified partners in both the public and private sector to identify the skills gap and develop strategies to fill it. Jim Brown, Director of Energy Skills Partnership Scotland has said of Moray East:

"We [The Energy Skills Partnership (ESP)] have been impressed with Moray East's proactive approach towards the skills agenda and we have enjoyed working with them to understand the requirements of the Moray East development and understand the future skills requirements. This early engagement has allowed ESP do a lot of preparatory work with our college members and industry bodies to ensure our member colleges can support the whole supply chain."

1 Contact Details

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2 Project Details

Project Name	The Moray East Project (the Project)	Project Size (in MW installed capacity)	Up to 1,116MW
Project Commissioning Date	Before end of 2022	Project Location	Moray Firth, north east Scotland (see Annex 1)
Ownership Structure	Moray Offshore Renewable Power Limited		
Maturity of Project	<p>Wind farm Section 36 consents and marine licences awarded in March 2014 and September 2014 respectively.</p> <p>Grid connection agreement was signed in July 2014, with transmission infrastructure consents awarded in September 2014 and an Agreement for Lease signed in August 2014.</p> <p>Final investment decision (FID) is scheduled for June 2018.</p> <p>Construction expected to commence in August 2018 onshore and March 2019 offshore.</p> <p>Delivery of first electricity expected to be Q2 2021 if awarded CfD in 2017.</p> <p>Full operation expected to be before the end of 2022.</p>		

3 Introduction

3.1 The Moray East Project and EDPR

- 3.1.1 Moray Offshore Windfarm (East) Limited (known as Moray East) is a project company set up under Moray Offshore Renewable Power Limited to develop the Eastern Development Area (EDA) within Zone 1 of the Round 3 offshore wind programme (the Project). The Zone is located in the Moray Firth, Scotland. The Project is the first site within the Round 3 Zone 1 to be developed.
- 3.1.2 Moray Offshore Renewable Power Limited's mother company is EDP Renewables (EDPR), see Annex 1 for the full company structure. EDPR is a multinational market leader: the fourth largest wind developer globally with an offshore wind portfolio spanning the UK, Portugal and France.

3.1.3 When entering a market, EDPR makes long term commitments and follows through with them. It is one of the reasons EDPR has ranked #1 on the Dow Jones Sustainability Index for six years running. For instance, EDPR was one of five companies which established the ENEOP consortium in Portugal which delivered an industrial complex including five new plants, training and R&D centres to supply turbines to service multiple developers' wind energy projects; today EDPR remains the principal developer of the consortium. EDPR's success in France in securing development rights for two projects in French waters with GDF Suez was predicated on industrial plans driven by binding commitments which are now being implemented. Moray East will see that contracted suppliers execute their supply chain plans with similar binding commitments in the UK.

3.1.4 EDPR's considerable experience will be transferred to the development of competition, innovation and skills within the Moray East, and wider UK offshore wind, supply chain through EDPR's management of Moray Offshore Renewable Power Limited. For instance, the Moray East Project is committing to adapt EDPR's M3 programme, an innovative approach to procuring maintenance services, which increases competition and opportunities for local suppliers.

3.2 Project Summary

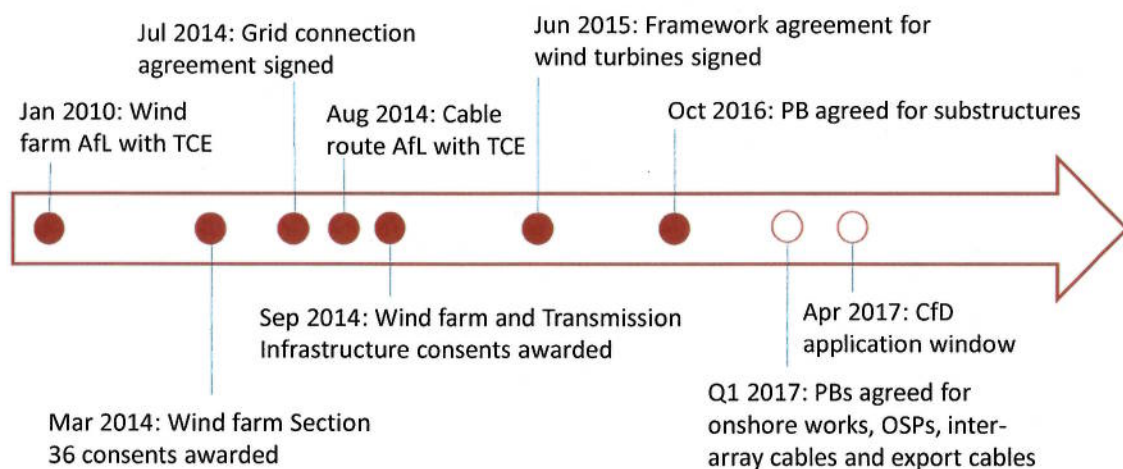


Figure 1: Key project milestones for the Development Phase of the Project. Where, ● indicates milestone completed and ○ indicates upcoming milestone and where: AfL = Agreements for Lease; CfD = Contract for Difference; OSP = Offshore Substation Platform; PB = Preferred Bidder; and TCE = The Crown Estate.

3.2.1 Figure 1 illustrates the key milestones for the Development Phase of the Project, which will complete in Q2 2017. Prior to the Project being identified, consents for a total overall capacity of 1,116MW across three wind farm sites (Telford, Stevenson and MacColl) within the EDA and a grid connection agreement at New Deer were obtained. As discussed in Annex 1, the Project is the outcome of further refinement of the layouts of the original sites to capture optimal spacing and utilise the most attractive bathymetry and ground conditions. The Project will construct and operate utilising the existing Section 36 consents, Marine Licences and Planning Permission.

3.2.2 To date [REDACTED] has been directly invested in the Project, of which circa [REDACTED] was spent in the UK. An investment of [REDACTED] is required post-CfD to take the Project to Financial Close (FC) and a further [REDACTED] to fulfil the Engineer, Procure, Construct and Install (EPCI) contracts and the Project Construction phase. Preferred bidders for three EPCI contracts have so far been identified including [REDACTED].

The preferred bidders for the export cables and inter-array cable EPCI contracts will be identified in Q1 2017. Moray East is, and will continue to drive the preferred bidders to undertake competitive procurement of their subcontractors (e.g. fabricators, manufacturers), with the intention of signing Tier 1 contracts in May 2018. For further details see Annex 1.

3.3 Procurement Strategy and Process

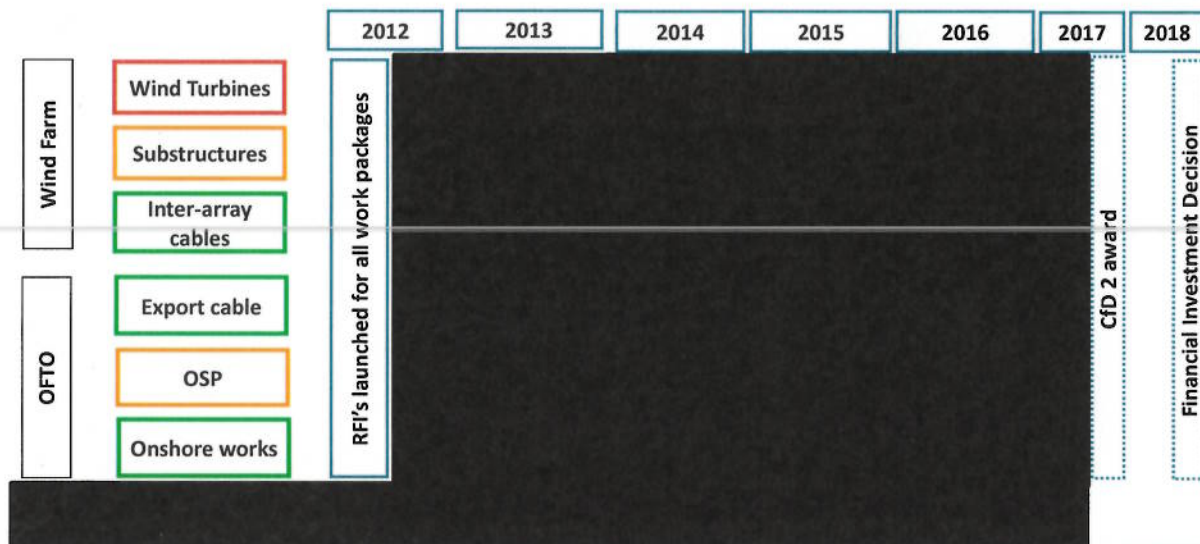


Figure 1: Diagram of the Moray East multi-stage tender process and timeline.

3.3.1 Moray East's competitive contracting strategy is driven by EDPR's requirement to compete in international markets on price; multiple competent suppliers in competition are vital for cost reduction. Moray East has adopted a dual pronged approach: a multi-contract strategy involving local and global suppliers tendering for six EPCI work packages (Figure 2), complemented by direct engagement with lower tier suppliers providing awareness of upcoming opportunities (Annex 1). This approach has and is allowing Moray East to work with a large number of supply chain competitors ensuring opportunities for competition are optimised. The split of the EPCI work across numerous packages has also allowed the company to ensure that risk was controlled and innovation harnessed by allocating responsibilities to the party best positioned to add value. Further details of the benefits of this approach are described in section 4.

3.3.2 EDPR's standard procurement process was used to implement the strategy and is as follows:

- Requests for Information (RFIs): used to understand the breadth and scope of the local and global supply chain, capability for delivering the service and the potential risks.

- Pre-qualification questionnaires (PQs): used to identify, assess and select Tier 1 suppliers to tender for the main work packages. **Tier 1 suppliers are asked to submit provisional Supply Chain Plans (SCPs) and local content opportunities as part of the qualification criteria.**
- Requests for Proposals (RFPs): involves a number of phases which allow for suppliers to be short-listed over time following commercial and technical assessments. The short-listing of suppliers at RFP phase 2 and/or 3 is used to optimise, and ensure value is added to proposals (e.g. through design competition) while developing binding price offers and contracts.
- Preferred Bidder Appointments: once identified, Moray East works with the Tier 1 EPCI Contractors to maintain the approach of adding value to the tenders. This includes agreeing the approach to identifying the lower Tier 2 supply chain and working together on developing project specific SCP commitments.
- **Identification of Key Subcontractors: this is undertaken in collaboration with preferred EPCI Contractors following the RFP process.** This process is focused on ensuring access for as many capable and qualified suppliers as possible to the selected EPCI Contractor. The Project retains the right to reject particular subcontractors if necessary.

3.4 The Supply Chain Plan

3.4.1 This SCP for the Project is submitted by Moray East to the Department for Business, Energy and Industrial Strategy (BEIS) in order to obtain qualification to enter the second round of Contract for Difference (CfD) for renewable energies. The current plan is based on the 2014 the Project SCP, submitted by Moray Offshore Renewables Limited (MORL), which allowed the Project to qualify for the first round of CfD.

3.4.2 Compared to the 2014 submission, this 2016 SCP introduces the following actions/commitments:

Competition (section 4)

- RFI process for turbine installation to drive competition within the wind turbine EPCI contract.
- Moray East requires Tier 1 suppliers identified as preferred bidders to commence competitive procurement for subcontracts (i.e. Tier 2 suppliers) prior to contract award.
- Support for [REDACTED] by helping to remove barriers to entry into offshore construction markets.
- Workshop providing feedback about RFPs to Tier 1 suppliers/key subcontractors.

Innovation (section 5)

- Research studies into gull behaviour and impacts on site selection and operating conditions.
- Research into [REDACTED] radar which will remove objections to wind farm construction.

- Sponsorship of a PhD researching wind resource wake effects and improve yields.

[REDACTED]

[REDACTED]

- The use of aluminium cables to reduce costs.
- Investigating recent advances in walk to work technology to increase offshore working time.
- Use of innovative [REDACTED] modelling tools to support improved procurement and lower costs.

Skills (section 6)

- Developing internal skills through supporting staff in extra-professional endeavours.
- Commitments to enhance development of diversity within the company and industry.
- Commitments to increase the external skills pool through identifying opportunities for supporting student research programmes; developing an apprenticeship programme and sponsoring a bursary programme.

3.4.3 Where possible, the potential impacts on the Levelised Cost of Energy (LCOE) resulting from commitments/actions are quantified using the TCE - *Cost Reduction Pathways Study*¹. Based on this reference, the following actions are directly contributing to reducing LCOE:

Action	Potential reduction in LCOE
Driving competition in wind turbine generator (WTG) installation	6%
Potential deployment of next generation WTGs	17%
Early engagement of suppliers in substructure design	3.1%
Improved installation methods for substructures	3-4% for jacket installation 10-15% for Gravity Base Structure (GBS) installation
Mass production of substructures	2.6%

3.4.4 In addition, the following actions not quantified by the *Cost Reduction Pathways Study*, will also directly contribute to lowering LCOE: open tendering process driving competition and optimised commercial offers; wake effect research; and design of the transition pieces.

3.4.5 It is also highlighted that the delivery of the Project will support the development of the UK supply chain, in terms of local content, where UK suppliers offer competitive best-value offers. The operations and maintenance (O&M) phase will provide the bulk of local content. However, the construction phase will offer significant possibilities. For example, potential local content for the

¹ <http://www.thecrownestate.co.uk/media/5493/ei-offshore-wind-cost-reduction-pathways-study.pdf>
(Link to the referenced document "Cost reduction pathways study", The Crown Estate (2012)).

EPCI contracts where preferred bidders have been identified is as follows:

- The wind turbine supply contract is expected to deliver [REDACTED] % local content.
- The jacket substructures contract has the potential to deliver up to [REDACTED] % local content.
- The onshore electrical works and OSPs contract is expected deliver [REDACTED] % of local content.

3.4.6

[REDACTED]
[REDACTED]
[REDACTED] In order to deliver this and more, the local supply chain must continue to commit to lowering the cost of energy and EDPR relies on the continuing support of the Government in developing the competitiveness of the UK supply chain to meet both domestic deployment as well as maximising export opportunity.

3.5 Document Structure and Instructions to Reader

- 3.5.1 The following sections set out Moray East's SCP by stating the issues guiding the Project actions, describing the actions and resulting impacts. Actions yet to occur are considered commitments and are highlighted in italics. Supporting evidence to validate claims and actions taken is provided in the Annexes, or in footnotes where evidence is from a website (which are printed and presented for convenience in Appendix 2). Annex 2 provides a log of Moray East's past and ongoing actions and future commitments. Please note, some evidence may be provided in the name of MORL and may include a Repsol logo. Repsol was a former shareholder of MORL at the time the evidence was produced and MORL changed its name to Moray East in December 2016.
- 3.5.2 UK content analysis is calculated for contracts with a preferred bidder based on current estimations of potential UK content provided by the supplier and/or judgement by Moray East.
- 3.5.3 Going forward, Moray East commits to continue its regular meetings with BEIS and the Department for International Trade (DIT) Renewable Energy Team and issue reports, on a frequency to be agreed, on the progress being made on implementing this SCP, ensuring that Moray East, the supply chain and the low carbon industry can realise the benefits envisaged.
- 3.5.4 Information which is confidential and/or commercially sensitive is highlighted with turquoise highlights and listed in Annex 3. For the avoidance of doubt, annexes are confidential/commercially sensitive although not marked in turquoise in their entirety. All confidential/commercially sensitive information will remain confidential/commercially sensitive also on or after the project's Milestone Delivery Date. At the time of publication, Moray East will review the status of this information and redact accordingly.

4 COMPETITION

4.1 Competition Highlights

- 4.1.1 Moray East has been engaged with the supply chain from the early phases of the procurement process in order to drive competition and address issues. This has included working with suppliers to increase the competitiveness of their offers and addressing industry issues in partnership with suppliers, through actions such as competition by design.
- 4.1.2 *Moray East commits to ensuring Tier 1 suppliers will deliver competitive procurement of subcontractors.* This will include Moray East being actively involved in guiding the procurement process, working in partnership to support subcontractors to deliver competitive offers. Moray East will also contractually oblige Tier 1 suppliers to engage with local suppliers at supply chain events specific to their EPCI contract, with the goal of increasing the diversity of competitors.
- 4.1.3 Moray East commits to holding a series of supply chain events for local suppliers specific to the O&M phase. Moray East also commits to holding discussions with other local renewable energy developers to identify opportunities to stimulate the creation of a local cluster of providers specific to the O&M phase of projects.

4.2 Encouraging Competitive Procurement

- 4.2.1 **Issue.** Encourage competitive procurement processes and more open competition across the supply chain to ensure that the widest pool of candidates are able to bid for, and win, contracts.
- 4.2.2 **Actions.** As described in Annex 1 and summarised in section 3, Moray East uses a multi-stage procurement process. The stages are tailored to ensure the breadth and scope of the global supply chain, and where possible new entrants, are involved and the potential for UK content is maximised. Competition is pushed as far as practical within the process with suppliers driven to improve their competitiveness and decrease risk. This lowers the costs and improves the offer quality and value.
- 4.2.3 **Impacts.** **1.** As shown in Annex 4, 165 potential Tier 1 suppliers, across a diverse range of service providers, were invited to take part in the Moray East EPCI procurement process. This ensured engagement at a UK and global level and broad awareness of the pipeline of requirements and drivers for the Project. **2.** The open tendering process including a two or three phased RFP process, promotes competitive pressure for as long as feasible, thus supporting the development of optimised tenders which reduce the LCOE for the Project. **3.** The process also provides flexibility to identify further competitive advantages within the overall contracting approach; for example, by consolidating work packages (section 4.2.8) or by splitting the EPCI packages into smaller contracts (section 4.2.6).

- 4.2.4 **Action.** The base case for the Project's procurement strategy was to award multiple EPCI contracts. As illustrated in Annex 1, six key work packages were initially tendered.
- 4.2.5 **Impacts.** When compared to the more traditional approach within the wider generation industry of using a turn-key contract or even alliancing, the multi-contract strategy offers significant competitive benefits. Multiple contracts support a diversity of Tier 1 suppliers within the Project compared to one over-arching Tier 1 supplier. This filters down through the supply chain, with Tier 1 suppliers following their own competitive procurement processes to secure best value from their subcontractors (Tier 2 and 3 suppliers). This promotes a waterfall effect of competition down through each level of the supply chain and ensures diversity at all levels of suppliers. Further competitive benefit is achieved through reducing "embedded contingencies" that are included in turnkey contracting. Overall, this contributes to the wider development of competitive services available to the offshore wind industry.
- 4.2.6 **Action.** As described in Annex 1, Moray East launched an [REDACTED]. This allows Moray East to gather information from the market to identify whether further cost savings could be secured for this particular service.
- 4.2.7 **Impacts.** Flexibility in contracting allows for further opportunities for competition to be assessed. By testing the strategy of using a full EPCI contract or separately contracting components of the overall package, Moray East is continuing to keep pressure on [REDACTED] to ensure their bid for the full EPCI package is optimised to lower costs. It also allows Moray East to understand the offers from the UK supply chain and to provide feedback to support the development of the supply chain at the conclusion of the process. Driving competition within the installation supply market can also result in a 6% reduction in LCOE².
- 4.2.8 **Action.** As shown in Annex 1, the transmission infrastructure works necessary to connect the wind farm to the wider onshore transmission system were initially split into three work packages before being consolidated into two packages.
- 4.2.9 **Impacts.** 1. By tendering three work packages at the same time, Moray East increased the opportunities for more companies to tender for the work. In addition, allowing contractors to form consortia further leveraged competition within the market. This approach maximised the competition for all packages, recognising the global expertise for the onshore and offshore elements of these work packages. 2. By incorporating lessons learned during the procurement process into the supply chain engagement, the OSP and onshore work packages were consolidated to ensure the right technical and commercial solutions were selected, removing risk from asset construction and the subsequent Offshore Transmission Owner transactions and improving the overall value for money of the offers. 3. Whilst there have been investments by

² The Crown Estate (2012). Cost reduction study. Pages 23 where relevant cost reduction is presented.

European manufacturers in high voltage (HV) submarine cables in recent years, supply is constrained and margins can be high. By undertaking a global sourcing strategy for export cables, Moray East ensured strong competition in the process, reducing costs and securing an optimal technical solution.

4.2.10 **Action.** Initially, the inter-array cables and substructures procurement processes were executed in parallel to allow Moray East to explore the potential for combining the two packages at RFP phase 2. Substructures are the entrance/exit point of inter-array cables to the turbine infrastructure and also provide protection for cables for the majority of their length within the water column.

4.2.11 **Impacts.** The procurement approach taken allowed the potential optimisations of the interfaces to be identified and allowed an improved understanding of the risks and drivers of the relevant design features. Although the benefits were not substantial enough to warrant consolidating the packages, the approach did lead to more cost-effective tenders.

4.2.12 **Action.** As described in section 3.2 of Annex 1, [REDACTED]
[REDACTED]
[REDACTED]. This includes Moray East working with Tier 1 suppliers to agree technical specifications, commercial and contract terms and short-listed suppliers. As confirmed in Annex 1, Tier 2 suppliers will also be requested to provide SCPs, an example of which is provided in Annex 5. The Project team will actively work with the Tier 2 suppliers, assessing their supply chain plans in the context of the project and the opportunities that may be created at a local level.

4.2.13 **Impacts.** As the final contract is not signed until after the Tier 2 supply chain is agreed, Moray East incentivises the Tier 1 suppliers to maximise competition and local content opportunities (e.g. for fabrication, manufacturing services etc) within their supply chains. With Moray East's involvement, it can be ensured that offers from local suppliers that may have less experience, have the opportunity of improving the competitiveness of their bids. Overall this will result in cost optimisation through supply chain competition and diversity.

4.3 Supply Chain Breadth and New Entrants

4.3.1 **Issue.** Encourage broader supply chains by supporting new entrants to the sector, including identifying companies considered as potential Invitation to Tender or pre-qualification candidates where appropriate.

4.3.2 **Action.** As described in the Project Plan (Annex 1), a broad search base was used to identify candidates identified for inclusion in the Moray East procurement process, ensuring relevant UK suppliers were invited to participate as well as drawing from the wider global market. Annex 4

provides a table of the numbers of suppliers invited to participate in the procurement process for the EPCI contracts. This also highlights where suppliers, considered new entrants at the time of engagement, have been involved in the EPCI contract process and their progress throughout the process.

- 4.3.3 **Impact.** As highlighted in Annex 4, 23 suppliers, considered new entrants at the time of engagement, were involved in the EPCI process. [REDACTED]

Furthermore, the same approach to procurement was used for the Offshore Met Mast (OMM), which resulted in the appointment of Drace, a new entrant to the offshore wind market, as the Tier 1 supplier.

- 4.3.4 **Action.** During the RFP stage 1 for the wind turbines EPCI, Moray East worked with suppliers to improve the competitiveness of their offers and in some cases (e.g. for suppliers such as [REDACTED]) to support entry to the offshore wind market. In addition to holding workshops to evaluate new technologies, Moray East facilitated engagement with the Scottish Government and DECC/DIT in order to allow the potential opportunities for local industrial experience and the potential for a Scottish based nacelle manufacturing base to be explored.

- 4.3.5 **Impact.** Such engagement provided new entrants with an understanding of the renewables market and provided all suppliers with information on how local industry service suppliers could support the Tier 1 tender offer. Such project specific engagement provides experience which can be transferred to supplier offers for other offshore renewables projects.

- 4.3.6 **Action.** Moray East has used the following initiatives to ensure that lower tier suppliers are included in the Project supply chain. **1.** As evidenced in Annex 6, in March 2012 Moray East launched a Pilot Programme of supply chain engagement with Highlands and Islands Enterprises (HIE), Scottish Enterprise (SE) and Scottish Development International which allowed the agencies to identify new entrants to offshore wind, including both local suppliers and foreign companies with aspirations to invest in Scotland. **2.** Suppliers are invited to complete a supplier registration form available on the Moray East website³. This database is compared with the supplier list held by HIE. The resulting consolidated supplier list is distributed to suppliers in RFP Stage 2 (Annex 1).

- 4.3.7 **Impacts.** The Moray Firth region contains a wealth of experienced offshore service providers which had and have not yet engaged with the offshore wind market. This approach ensures Tier 1 suppliers are informed of potential new entrants and local suppliers that can be included in their supply chains. The pilot programme allows local companies to benefit from the Moray East

³ Link to supplier registration form: <http://morayoffshorerenewables.com/getdoc/ebea9f60-4da7-458a-9ce2-1dc111bd614f/Supply-Chain.aspx>

procurement process by providing a justification for obtaining Government support to develop their potential for maximising the potential opportunities. *Moray East shall use all reasonable endeavours to encourage Tier 1 suppliers to use this information to inform the subcontractor procurement process (see section 4.2.12 for more details).*

4.3.8 **Action.** Reliance on Original Equipment Manufacturers (OEMs) to manage maintenance once equipment is out of warranty, limits the potential for new entrants to enter this part of the supply chain. EDPR developed a M3 (Modular Maintenance Model) programme, which focuses on life after warranty and works by focusing on driving down costs by increasing diversity in the supply chain (Annex 7). In particular, a M3 programme works by outsourcing maintenance services such as preventative maintenance, some major corrective maintenance, small repairs and supply of spare parts from independent service providers. A technical support agreement is still maintained with the OEM as back-up. *Moray East will therefore hold a series of supply chain events to identify local suppliers suitable for a M3 programme, while providing information to the market about service/supply needs and timescales.*

4.3.9 **Impact.** The M3 approach delivered significant cost savings for the O&M phase of onshore wind farms by promoting competition and diversity within the supply chain (Annex 7). A M3 programme would increase diversity in the maintenance services supply chain for offshore wind projects and through this promote competition and lowered costs. Through Moray East's action to investigate the potential for such a programme for EDPR's offshore wind portfolio including the Project, these benefits could be extended to the wider offshore wind supply chain and associated costs of energy of projects. Such a programme could support the development of a regional cluster of maintenance service providers, which are expected to include multi-functional service providers, within the Moray Firth area. The proximity to various offshore and marine renewables projects in north-east Scotland provides the opportunity for creating a critical mass that could stimulate the creation of a local cluster of suppliers. *Moray East also commits to holding discussions with these projects to identify opportunities to realising potential benefits.*

4.4 Removing barriers to entry

4.4.1 **Issue.** Identify and remove barriers to entry for new supply chain companies.

4.4.2 **Action.** Moray East sourced a number of new entrants supplying jacket and GBS for the substructure EPCI contract. It was identified that the stage of development of some of the designs, especially those of the GBS, could reduce the potential competitiveness of the available offers. Therefore, Moray East incorporated [REDACTED] commercial competition to ensure the most cost-competitive design with lowest risk could be further developed and selected.

- 4.4.3 **Impacts.** Incorporating both design concepts within the competition until the second RFP stage promoted and maintained competition between the most promising next-generation substructures for as long as practical. The design competition incentivised the suppliers to innovate and optimise the design and installation features, improving the design life, reducing risks and ultimately lowering costs. Examples of such innovations are described in section 5.5 of this document. Overall, this process has supported both new entrant GBS suppliers and jacket suppliers to advance their concepts. The improvements can be taken through to other offshore renewables tender processes increasing the future competitiveness of suppliers.
- 4.4.4 **Action.** Moray East identified that local manufacturing of GBS structures could improve the cost-competitiveness of GBS offers but such facilities local to the Project site were not yet available. Moray East signed (Memoranda of Understanding) MOUs with relevant facility owners (e.g. [REDACTED] – as shown in Annex 8) to support facility owner plans for maximising on the opportunities available through projects such as Moray East. The support included facilitating meetings between the local facility owners and the Tier 1 suppliers and development agencies such as HIE.
- 4.4.5 **Impact.** Although GBS have not been selected for the Project, these activities have supported the development of plans for new manufacturing facilities, which could provide services to other projects.
- 4.4.6 **Action.** As described in section 6.7.4, Moray East is supporting [REDACTED] in their diversification of services offered to the offshore renewables industry. As shown in Annex 9, by engaging [REDACTED] to support survey work in the early Development phase of the Project, Moray East identified that the certification of vessels and crew was not necessarily aligned with the offshore renewable industry standards. Moray East facilitated engagement between [REDACTED], TCE and Renewable UK (RUK) to ensure that certification issues would not be a barrier to [REDACTED] working on offshore construction and operational projects.
- 4.4.7 **Impact.** Removing this barrier will allow [REDACTED] to realise the diversification of the services they can offer to offshore renewable projects (see section 6.7.4) and increase the supplier market for relevant lower tier services.

4.5 Improving awareness of commercial opportunities

- 4.5.1 **Issue.** Improve awareness of the commercial opportunities among both companies that currently supply to relevant low carbon generation sector and those that have the capability to do so, but have not yet entered the market.
- 4.5.2 **Actions.** Since 2010, Moray East has attended industry specific supply chain events *and will continue to do so, when appropriate, after CfD award*. Furthermore, as shown in Annex 10, Moray East has facilitated project specific meet-the-buyer events since July 2014. *Further project specific*

events will be held following award of a CfD to the Project. In addition, suppliers which are contracted by Moray East will be contractually bound to participate in these supply chain events, including activities such as face to face meetings with lower tier suppliers.

- 4.5.3 **Impacts.** 1. Relationships between new entrants have been facilitated e.g. Drace (a new entrant to market) was appointed as the EPCI contractor for the Moray East OMM. Drace was introduced to a range of local suppliers through Moray East organised meet-the-buyer events and other supply chain specific meetings. This resulted in the appointment of Global Energy Group (GEG), a new entrant to offshore wind at that time, as Tier 1 contractor for the lattice supply and Tier 2 for port infrastructure and offshore works⁴. This contract, their first in renewable energy, supported the migration of their skills and experience to offshore wind. They have subsequently won work with [REDACTED] renewables projects. 2. Benefits of the appointment of Drace also included the transfer of knowledge [REDACTED].
- 4.5.4 **Action.** As discussed in section 4.3.6, Moray East uses a supplier database to compile a supplier list. As described in section 4.2.12, following signing of the preferred bidder agreements for Tier 1 EPCI contractors, subcontractor procurement will commence. *Moray East will ensure that relevant suppliers in the database will be included in the RFI stage of the subcontractor procurement processes, including invitations to Project specific meet-the-buyer events.*
- 4.5.5 **Impact.** This will ensure that potential opportunities are communicated in a timely manner to as wide a supply chain as possible. For example, as discussed in section 4.3.8, such supply chain events organised for the O&M phase will be scheduled to allow suppliers time to develop the required packages and/or set up new facilities to service Scottish projects, in advance of the procurement process being opened.
- 4.5.6 **Action.** As shown in Annex 8, in 2014 Moray East signed MOUs with three local Scottish ports [REDACTED] to support their potential development as O&M bases and construction support for the Project. The MOUs promoted information sharing with the Project short-listed turbine suppliers, which facilitated the ports' engagement with local companies and skills providers, ultimately strengthening the competitive elements of the ports' offers for O&M services. Following the appointment of [REDACTED] as preferred turbine supplier, Moray East has also worked ensure that [REDACTED] requirements are sufficiently flexible to retain all three ports in the running as long as possible prior to contract award.

⁴ Evidence of supplier appointment and impact of contract: <http://www.scottishplant.co.uk/nigg-renewed-for-renewables/>; <http://www.windpoweroffshore.com/article/1314617/moray-firth-met-mast-installation-begins>

⁵ <http://renews.biz/70190/concrete-progress-for-offshore-duo/> (Evidence of Repsol using Drace for GBS structure)

- 4.5.7 **Impact.** The primary O&M base for the Project will be one of the aforementioned ports which will support the local economy. The upfront work with Moray East will also have strengthened the offers the ports [REDACTED] contracted to support [REDACTED] project.

4.6 Sharing best practice and lessons learned

- 4.6.1 **Action.** Risks associated with offshore transmission infrastructure can lead to significant costs and insurance claims for offshore wind developers. For example, common issues include subsea cable damage during installation and not achieving burial depth. During operation, issues include snagging of cables and faults. Moray East has retained experienced technical resources to support the procurement process, ensuring the process benefits from lessons learned from other wind farm projects. [REDACTED] (the project manager for the Beatrice Demonstrator Project and a past contractor for Moray East), was appointed as electrical design consultant. [REDACTED] has worked on the Zone since 2010 and has been appointed to advise on geological engineering issues. [REDACTED] has been appointed as management consultant for these work packages and will incorporate their experience from [REDACTED].
- 4.6.2 **Impacts.** These companies worked in conjunction with each other during the offshore transmission procurement process. Their experience was used to improve the contractual requirements for the export cable and OSP and onshore work EPCI packages, ensuring that suppliers worked to deliver innovation and solutions to minimise risks and mitigate against future costs post-contract award. The companies will then be able to take this experience to renewables industry projects they work on in the future.
- 4.6.3 **Action.** In 2015 Moray East/EDPR initiated, managed and financed a supply chain workshop with Scottish-based Tier 1 suppliers/key subcontractors as determined by the contracting strategy of key offshore developers. The workshop was facilitated by the Scottish Government and was attended by six developers who are active in the UK and five suppliers. The purpose was to maximise the potential of the supply chain for Scotland and as shown in Annex 10, included feedback from developers to Tier 1 and 2 suppliers on the experiences of the procurement processes undertaken, with information on the reasons (e.g. costs, facility provision, quality etc) why companies did not make it to short-lists.
- 4.6.4 **Impact.** By acting on the feedback provided by industry leading organisations the suppliers will be able to improve the competitiveness of their offers within future tender rounds for renewables projects.

4.6.5 **Action.** Moray East will continue to ensure lessons learned from the procurement activities are captured and shared with the industry through various forums such as:

- Trade organisations: Moray East/EDPR are represented on RUK, Scottish Renewables, Wind Europe and Global Wind Energy Council groups which provide a forum to share potential opportunities and experience across the industry through activities such as focus groups⁶.
- EDPR UK's Managing Director Dan Finch sits on the Offshore Wind Industry Council and the Offshore Wind Programme Board, whose major remit is the Cost Reduction Task Force⁷.
- Since 2010, Moray East has held regular meetings with BEIS, DIT, SE and HIE to share results from the Moray East procurement process and identify suppliers with which Moray East are working. *Moray East commits to continue this engagement through the Refinement, Execution and Operations phases of the Project to capture continuing opportunities.*

4.7 Moray East working in partnership with Tier 1 suppliers

4.7.1 **Issue.** In order to address the issues highlighted in sections 4.2-4.6, the actions taken work in conjunction with each other. To this end, Moray East also expects that Tier 1 suppliers work towards ensuring competition is maintained within their supply chains, thus ensuring the costs of EPCI contracts are optimised.

4.7.2 **Actions.** Moray East requires all suppliers to provide SCPs at the PQQ stage and updated SCPs at the RFP stage of its procurement process. Moray East has and *will award contracts which include a contractual requirement to deliver the contractor SCP commitments* and shall use all reasonable endeavours to support the Tier 1 suppliers deliver competition commitments in the procurement of subcontractors (see section 4.2.12). Suppliers must also make clear the potential for UK content within their SCPs. Examples of the competition specific commitments made in these SCPs by the preferred bidders for wind turbines, substructures and offshore substations and onshore works are provided below. Details and the full list of commitment are available in Annex 5.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

⁶ Evidence of industry group membership: <http://www.renewableuk.com/search/custom.asp?id=3933>;
<https://www.scottishrenewables.com/directory/members/e/>

⁷ Evidence of membership: <https://ore.catapult.org.uk/who-we-work-with/offshore-wind-industry-council/>

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- 4.7.6 **Impacts.** 1. This approach encourages Moray East's suppliers to review the market and identify opportunities for competition. Such market engagement provides information to lower tier suppliers on upcoming opportunities and the tender requirements of upper tier suppliers. 2. [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED] This is in addition to work driven by Moray East which will ensure that [REDACTED]
- [REDACTED] will be used as [REDACTED], a multi-million pound contract. 3. Moray East's initiatives and partnership approach with the supply chain provide significant opportunities for the involvement of local suppliers in the Project supply chain. The potential for local content in the EPCI contracts is outlined in section 3.4.5 with more detail provided in Annex 11. The combination of the creation of these opportunities and *Moray East's commitment to continue engagement with DIT, HIE and SE* provides an environment that will maximise opportunities for the development of the UK supply chain.

5 INNOVATION

5.1 Summary of actions and associated impacts

5.1.1 The following tables provides summaries of the actions taken and to be taken by Moray East which will benefit the Project and the wider industry. Section references which contain further details are provided in the table for each action. Examples of the application or sharing of lessons learned and development of best practice are highlighted within each section as relevant.

Table 1: Summary Table: Research and Development (R&D) actions

Action	Intended Impact	Status	Section Refs
CONSENTING			
Bird movements	Reduce potential for operational shut-down restrictions.	Gull surveys: complete. Tag development: ongoing.	5.2.3
Mitigation for noise effects on marine mammals	Reduce costs of mitigation measures. Project saving [REDACTED]	Survey technique tests: complete. Assessment method: complete. Mitigation techniques research: ongoing.	5.2.6
Trial novel fishing techniques	Saving of £750k per snagging/cable damage event avoided.	Trials to be done in 2018 assuming CfD awarded in 2017.	5.2.9
[REDACTED]	Remove [REDACTED] objections to wind farms and the Project.	Phase 1 of trials: complete. [REDACTED]	5.2.12
WIND RESOURCE			
Use of Leosphere and remote sensing equipment	Remove the requirement to have fixed met masts (saving £4m per met mast).	Leosphere trials: complete. Remote sensing trials: planned for pre-construction/ construction phase.	5.3.2
Wake effect analysis	Optimise wind farm efficiency. Contributes to LCOE reductions.	Research currently ongoing.	5.3.5

Table 2: Summary Table: Technological Innovation actions

Action	Intended Impact	Status	Section Refs
WIND TURBINES			
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
SUBSTRUCTURES			
Improved substructure designs	Optimise designs to produce lowest risk and best commercial design offers.	Design improvements: complete and ongoing.	5.5.2 5.5.4 5.5.5
Use of novel GBS concept for OMM	GBS as a commercial design for deep water wind farm location.	GBS structure deployed in 2014.	5.5.7
Adapted pile refusal tool	Increase the number of suppliers within the supply chain	Complete.	5.5.11
INTER-ARRAY CABLING AND TRANSMISSION INFRASTRUCTURE			
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
ACCESS SYSTEMS			
Walk to work technology	Improve access availability and reduce weather downtime.	To start in 2017.	5.7.2

Table 3: Summary Table: Contracting and Procurement Innovation

Action	Intended Impact	Status	Section Refs
OPTIMISED CONTRACTING			
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
O&M			
M3 programme	Increase diversity and competition within the supply chain, reducing O&M costs.	To start in 2017.	5.8.5

5.2 R&D in Environment-OWF Interactions

- 5.2.1 Moray East is committed to tackling challenges related to the uncertainties in the receiving environment and performing research and taking innovative approaches to fill the gaps as listed in the following paragraphs. This commitment to cutting edge research has been recognised by Moray East's key stakeholders and in 2014 Moray East was shortlisted for RSPB's Sustainable Development Award⁸.
- 5.2.2 **Issue.** The presence of highly protected large gull species at an offshore wind site could result in temporary shut-down restrictions on operational wind farms which can increase the cost of energy.
- 5.2.3 **Actions.** As shown in Annex 12: EDPR and the Centre for Ecology and Hydrology led a National Environmental Research Centre funded novel study into large gull species feeding behaviour; and Moray East is contracting with Offshore Renewable Energy Catapult with additional funding from HIE and Marine Scotland Science and others, to stimulate the supply chain and understand the feasibility of developing a bird tag which will increase the confidence in bird behavioural studies for offshore developments.
- 5.2.4 **Impacts.** **1.** The NERC funded study results have been published and shared with Government bodies, the industry and stakeholders in order to inform future site selection and assessment studies for offshore renewables projects, reducing the risk for obtaining future consent applications and having shut-down conditions imposed which cause losses of revenue. **2.** The next phase of the tag study will see Moray East working through Offshore Renewable Energy (ORE) Catapult with tag suppliers to develop the novel tags. This will be done in consultation with statutory conservation bodies, Non-Government Organisations, academia and other users of tag technology to ensure such tags can be used across the UK and Europe on any relevant marine renewable project. As shown in Annex 12, the tags would expand the customer base for these small and relatively niche suppliers and the broad customer base will decrease the costs of the tags themselves.
- 5.2.5 **Issue.** Accurately predicting the density and distribution of marine mammals in the offshore environment is difficult because techniques have significant limitations in detecting these elusive species. This increases the conservatism applied to impact assessments which can lead to costly mitigation measures, e.g. delays to piling events and temporal restrictions on piling campaigns.

⁸Evidence of nomination: <http://www.rspb.org.uk/thingstodo/natureofscotland/previous/shortlist.aspx>

5.2.6 **Actions.** As shown in Annex 13 and summarised below, Moray East has engaged in a range of R&D actions associated with marine mammals both in partnership with the University of Aberdeen and/or industry:

- Pioneering the use of novel whistle classifier to identify the calls of different dolphin species.
- Developed a new approach (“Seal Assessment Framework”) to assessing the impacts of piling noise on seals and dolphin species.
- Funded research into marine mammal biology and underwater noise.
- Investigated the use of Acoustic Deterrent Devices (ADDs) as an alternative to monitoring techniques prior to piling events and is currently developing an innovative approach to mitigating the effects of piling noise on marine mammals. This uses ADDs as the main mitigation in combination with a risk based approach to assessing near-field injury to marine mammals and the consequences to the population.

5.2.7 **Impacts.** Evidence for the listed impacts is presented in Annex 13. **1.** Increasing confidence in marine mammal impact assessment and mitigation techniques will decrease risk to consent applications and piling restrictions which affect the timing of installation activities (e.g. no piling during summer months) which can increase weather risk and therefore costs. **2.** An industry study concluded that the acceptance of ADDs as an alternative to current mitigation could have a financial benefit of £10ks-£100ks. [REDACTED]

[REDACTED] **3.** Use of ADDs will also promote the development of this technology and the associated supply chain including [REDACTED] **4.** Having been pioneered in the Moray Firth for the Moray East project, the whistle classifier data has contributed to a PhD thesis investigating its use in conservation work. **5.** The Seal Assessment Framework has been adopted by Marine Scotland, Scottish Natural Heritage and Joint Nature Conservation Council and has been used to support applications for other offshore wind projects.

5.2.8 **Issue.** Some fishing techniques can result in snagging of subsea cables, leading to down time for turbines, repair costs for cables and compensation costs for fishermen for damaged/lost gear.

5.2.9 **Action.** Moray East is working with Bangor University and the fishing industry and has developed a protocol for testing the compatibility of scallop gears with buried cables. *The in-field trials will be carried out in 2018 subject to the award of a CfD in 2017.*

5.2.10 **Impacts.** 1. [REDACTED]
[REDACTED]
[REDACTED]. 2. As indicated in Annex 14, the gears being tested have not yet been commercially trialled and will therefore also support the development of this artisanal fisheries gear industry.

5.2.11 **Issue.** [REDACTED]
[REDACTED]

5.2.12 **Actions.** [REDACTED]
[REDACTED]
[REDACTED]

5.2.13 **Impact.** [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

5.2.14 As shown in Annexes 13 and 14, Moray East has shared **lessons learned** through the publication of the environmental innovation research work in peer reviewed journals and through presentations at conferences. Moray East will also continue to share results through Scottish Renewables and RUK Consents and Licensing Groups and other relevant industry/scientific forums.

5.3 Innovation in Wind Resource Assessment

5.3.1 **Issue.** Offshore wind farms require a robust data set to obtain finance for construction. Typically, such data is collected through the offshore met masts, which cost developers millions of pounds to install. This installation is done at financial risk to the developer.

5.3.2 **Actions.** 1. As shown in Annex 16, EDPR and Moray East have been pioneering the use of the [REDACTED] fixed LiDAR, a remote sensing technique, for offshore wind data collection since 2011. This data has been validated using data gathered from a fixed offshore met mast, installed in 2015. 2. EDPR deploys a Floating LiDAR system, developed by AXYS Technologies, in Portuguese waters supporting activities related to developing floating wind turbines¹⁰. The floating LiDAR is part of an ongoing EDPR technology study evaluating the most cost effective path for “commercialising” data obtained from floating LiDAR: a. the data is accepted by financial

⁹ <https://www.iscpc.org/documents/?id=142> (page 8 provides the evidence of the potential saving)

¹⁰ Evidence of partnership: <http://axystechnologies.com/axys-windsentinel-selected-edp-inovacaos-demofloat-initiative/>

institutions so that they would view projects as 'bankable' (i.e. provide project financing at reasonable interest rates); and b. that wind turbine manufacturers will accept the data for measuring compliance to their power curve warranty. This study includes the option to bring the floating LiDAR, which has been trialled in Portuguese waters since July 2014, to the Zone. Initially, the data collected will be validated against the Moray East OMM data. Following this, Moray East shall consider, depending on the outcome of the evaluation, the use of floating LiDAR for wind data collection around the Zone rather than installing another fixed met mast, thus pioneering the use of floating LiDAR within a Round 3 Zone. The timing of the trials and future use on the Moray East site is currently under discussion.

- 5.3.3 **Impacts.** 1. Validation of floating and static LiDAR techniques is at an early stage, therefore these projects will increase the number of devices suitable for the industry, increasing competition between manufacturers and reducing the costs of deployment. 2. The use of LiDAR compared to the installation of an offshore met mast is expected to have cost reductions in the range of £4m¹¹, contributing to reducing the cost of energy. 3. The floating LiDAR being trialled by EDPR is also to be installed at one of EDPR's French offshore sites, extending the use of this technique to commercial sites within the wider EU. 4. Research into developing commercial acceptance of floating LiDAR, by both financial institutions and wind turbine suppliers, shall also support the analysis and validation of other types of LiDAR systems. 5. As illustrated in Annex 16, Moray East's contractor is involved in the [REDACTED] which helps to advance the development of the technology, providing an avenue for applying lessons learned from the Moray East project to further this goal.
- 5.3.4 **Issue.** Wake effect is one of the remaining big uncertainties in modelling the energy yield of an offshore wind farm, affecting the confidence in ensuring optimised design and maximum efficiency.
- 5.3.5 **Action.** As shown in Annex 16, EDPR has provided sponsorship to the University of Durham for PhD research into the thermal effects on the performance of wind farms.
- 5.3.6 **Impact.** Relevant results of the project are expected to be published in peer-reviewed journals allowing dissemination of information to other developers. This is an industry leading piece of work which will help increase the accuracy of wind farm yield models and allow optimised design and wind farm efficiency. This form of "lifetime care" is considered as an area which can will contribute to LCOE¹².

¹¹ http://www.ewea.org/events/workshops/wp-content/uploads/2015/06/20150522_PRES_EWEA_Floating-LiDAR-Acceptability_v0.1_ACr.pdf
(Page 2 provides evidence of the potential cost reduction)

¹² The Crown Estate (2012). Cost reduction study. Pages 23-24 provides evidence of the potential cost reduction.

5.4 Innovation in Wind Turbines

5.4.1 **Issue.** In recent years, a focus on achieving LCOE targets has led to a move to larger turbines (e.g. 7-8MW) meaning fewer offshore structures and more efficient installation and commissioning. Further improvements could be made if next generation turbines (e.g. greater than 10MW) were deployed.

5.4.2 **Action. 1.** The Project is taking steps to facilitate the deployment of a next-generation offshore wind turbine. **2.** [REDACTED]

5.4.3 **Impacts. 1.** Next generation turbines have the ability to reduce LCOE by 17%¹³. The progression of deploying larger turbines in Round 3 will continue to stimulate development of further improvements in turbine rating. **2.** [REDACTED]

5.5 Innovation in Substructures

5.5.1 **Issue.** Round 3 sites are in deeper waters than the majority of previous Rounds 1 and 2 sites, thus requiring the further development of appropriate substructure types.

5.5.2 **Action.** Moray East engaged both jacket and GBS suppliers in [REDACTED] rounds during the procurement process. The purpose of the studies was to develop and de-risk the proposed designs and lower costs. This type of study is not normally undertaken until contract award and this novel use of timing, although done at [REDACTED] risk to Moray East, has several benefits for the Project and wider industry.

5.5.3 **Impacts.** [REDACTED] the early competitive iterative design allowed the Project to minimise conservative assumptions early in the process. This benefitted the Project by improving [REDACTED]. For example, the load iteration process has been commenced at an early stage with the consequences of developing an optimum design, reducing the primary steel requirements and the construction assumptions have been validated by the supply chain thus allowing the Project to accurately identify the most cost-effective substructure solution. [REDACTED]

¹³ The Crown Estate (2012). Cost reduction study. Pages 16-18 provide evidence of the potential cost reduction.

5.5.4 **Action.**

worked with to de-risk and validate the novel designs and/or optimise designs through the use of advanced analytical methods. Innovation areas included:

- Reduction in jacket weights resulting from
- The development of optimised and new installation technologies, e.g. jack-up vessel leg extensions for operation in deeper waters.
- Direct engagement between designers and fabricators to ensure designs are suitable for serial production of jackets which will reduce costs and minimise construction programmes. This includes the use
- Moray East and the preferred bidder are working at optimising installation sequencing and planning in order to decrease substructure design and construction costs.

5.5.6 **Impacts.** The benefits of the design innovation relating to substructures are as follows:

- Through the improvements in the innovative jacket and node designs, there will be reductions in overall weight and production complexity. The work being done for Moray East by suppliers and certification authorities will improve the commercial opportunities for suppliers.
- The reduction in weight will also benefit decommissioning, as smaller vessels can be used for the removals process. These innovations could also be applied to other industries, e.g. wave, tidal, oil and gas.

¹⁴ The Crown Estate (2012). Cost reduction study. Page 25 provides evidence of the potential cost reduction.

¹⁵ The Crown Estate (2012). Cost reduction study. Page 25 provides evidence of the potential cost reduction.

¹⁶ The Crown Estate (2012). Cost reduction study. Page 23 provides evidence of the potential cost reduction.

5.5.7 **Action.** Moray East has installed a fixed OMM using an innovative GBS design¹⁷. The design includes the following innovations:

- The caisson was fabricated in a floating dock which demonstrates the ability to mass produce concrete substructures for offshore wind. Impact. Mass production will allow economies of scale, leading to cost reductions in substructure fabrication.
- A hybrid self-installing floating structure with a steel shaft on top of a concrete caisson which avoids the use of costly heavy lift vessels during installation and decommissioning. Impact. Improved met mast design can potentially lower costs by approximately 40% per installation¹⁸.
- Use of a telescopic lattice mast which removed the need for high risk helicopter installation. Impact. Improved health and safety and cost savings on CAPEX.
- This first GBS to be installed in a deep water site (>40m) in the UK. Impact. This proves the concept as suitable for deep-water sites, which will increase the competition between substructure suppliers for future sites.

5.5.8

Furthermore, based on the **lessons learned** in designing the GBS for Moray East, the solution was subsequently adapted

5.5.9 EDPR is leading an EU funded partnership of ten European entities (industry, R&D and University companies) to develop an innovative GBS foundations for large scale offshore wind deployment²⁰. **Lessons learned** from the deployment of the Moray East OMM are being used to benefit this study. As highlighted above, this concept would remove the need for the use of heavy lift vessels and the complexity and risk of offshore operations

The project is currently at Technology Readiness Level (TRL) 5 and is ready for trialling at full scale operational conditions (at WindFloat1 demonstration site). The project will support technology development and bring the technology close to market readiness (TRL 7). Additionally, the project will undertake further technology development for improved design and perform an in depth evaluation of the technology's future industrialisation, competitiveness and bankability. The ultimate result will be to increase the number of technology ready concepts available to the offshore wind industry suitable for deeper waters, increasing the competition between suppliers and thus lowering costs to developers and thus consumers.

¹⁷ Evidence for installation of an innovative design : <http://www.scottishenergynews.com/moray-offshore-renewables-installs-met-mast-in-moray-firth/>

¹⁸ Evidence for potential cost saving : <http://www.offshoremm.com/news/innovation/improved-met-mast-design-can-reduce-offshore-costs-and-environmental-impact/>

¹⁹ Evidence of design used by Inch Cape: <http://renews.biz/70190/concrete-progress-for-offshore-duo/>

²⁰ Evidence of the funding award for the Gravi3 project : <http://demogravi3.com/>

- 5.5.10 **Issue.** The number of suppliers that could be invited to tender for the substructures installation works was limited due to restrictions associated with the awarded consents.
- 5.5.11 **Action.** On behalf of Moray East, [REDACTED] adapted a standard pile refusal model, in order to understand the blow energies required for piling across the different soil profiles of the Project site in significantly more detail that is traditionally required. See Annex 13 for details.
- 5.5.12 **Impact.** By increasing the detail and understanding of the blow energies required and impact on underwater noise, [REDACTED]
[REDACTED] This allowed more suppliers to be included within the procurement process, driving cost competition.

5.6 Innovation in Inter-array Cabling and Transmission Infrastructure

- 5.6.1 **Issue.** Lessons learned from constructed Rounds 1 and 2 offshore wind farms have indicated that the design around the turbine/substructure/inter-array cabling/seabed interfaces are critical to the commissioning and operation of the wind farm. As the ratings of turbines increase, the risks of increasing loss of production from weakness in these interfaces increase. In addition to the costs of lost production, there are also the costs associated with repairing and maintaining larger sized projects at increasing distances from shore.

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

5.6.5 **Impacts.** The use of the principles are expected to result in a cost saving of [REDACTED] resulting from less vessel time expended on installation, the minimisation of additional cable protection measures and reduced post-installation remedial works resulting from damage. The application of the method will support the proof of concept of the adapted methodology.

5.6.6 **Issue.** Cabling is expensive and copper cabling is particularly expensive as the element is a rare commodity, which increases CAPEX costs for renewable energy projects.

5.6.7 **Action.** *1. Moray East is committing to the use of aluminium inter-array and export cabling. 2.* Moray East is exploring the use of 66kV inter-array cabling which can transmit more power than traditional 33kV cabling.

5.6.8 **Impacts.** *1.* Aluminium cabling performs almost identically to copper cabling but is likely to result in cost savings of up to [REDACTED] for the Project. *2.* 66kV inter-array cabling has recently become available to the market, fully type tested, following innovative work by cable manufacturers and The Carbon Trust. The use of this on the Project would result in c. [REDACTED] reduction in cabling requirements plus a decrease in installation time. It is estimated that this could result in cost savings of [REDACTED]. *3.* The Project's use of both these innovations, would support the larger scale use across the offshore/marine renewables industries, resulting in cost decreases for projects in general.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- [illegible]

- _____
- _____

- [REDACTED]
- [REDACTED]
- [REDACTED]

5.7.1 **Issue.** Working in the offshore environment is limited by weather conditions which have significant Health and Safety issues.

5.7.2 **Action.** *Moray East commits to investigating the potential in recent advances in walk to work technologies.* The walk to work system is a heave compensated gangway which is fitted to a

specially adapted installation support vessel, the gangway shall allow the operatives to access the working platform on an offshore structure directly from the vessel without having to undertake a small boat transfer from vessel to structure.

5.7.3 **Impacts.** Support of this recent innovation will bring the following advantages to offshore/marine industries:

- Increased safety for operatives compared to conventional methods of transfer.
- A significant increase in the weather limits for transfers [REDACTED] will result in reduced weather downtime and therefore reduced operational costs.
- This system combined with an installation support vessel would also allow construction and maintenance teams to be located offshore rather than transferring them from shore to site, thus significantly reducing non-productive time, increasing efficiency and reducing costs.

5.8 Procurement / Contracting Innovation

5.8.1 **Issue.** Metocean conditions significantly affect the safety and technical limits of operations at sea. Suppliers provide tenders for offshore works based on their own weather models. The influence of weather conditions on the ratio of at sea operation versus downtime can significantly affect the price of a tender and therefore the CAPEX and OPEX models, especially in projects located in such aggressive metocean conditions as the Moray Firth. Similarly, conservative assumptions on required cable lengths required for a project also increase costs.

[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[illegible]

5.8.4 **Issue.** Reliance on OEMs to manage maintenance once the OEM contract has expired incurs costs in terms of time and money.

5.8.5 **Action.** To drive down O&M phase costs, EDPR delivered innovation in the way it managed its onshore wind supply chain by developing the M3 programme (Annex 7). *The EDPR M3 O&M model will be adapted for the Moray East Project.* M3 focuses on life after warranty through a “hands on” approach to supply chain management and operational maintenance of wind farms, including:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

5.8.6 **Impact.** The approach delivered cost savings of between [REDACTED] for the O&M phase of onshore wind farms by promoting competition and diversity within the supply chain (Annex 7). M3 programme deployment could bring similar benefits to the offshore wind supply chain as well as support further innovation which become available in O&M activities in the near future.

5.9 Additional evidence of Best Practice and Lessons Learned

5.9.1 EDPR is also a principal shareholder of the WindFloat technology, an offshore wind turbine floating substructure. EDPR is currently involved in a number of prototype and pre-commercial phase projects using this technology, e.g. a pilot project in France²⁴. EDPR is also a shareholder in the Gravi3 R&D project, developing an innovative GBS (see section 5.5.9). Moray East personnel are advisors to these projects, allowing cross-fertilisation of experience between the projects. In addition, where turbines are from the same manufacturer across projects, this will allow comparisons between installation and operational performance and lessons learned to be applied across two different substructure types, allowing them to identify areas for improvements and standardisations which will benefit the wider offshore wind industry, irrespective of site type.

5.9.2 EDPR is continuously working with UK innovation enabling organisations, e.g. as a member of the Offshore Renewable Energy Catapult Industrial Advisory Group²⁵, and Offshore Wind Programme Board, participating in a number of work streams, including LiDAR, dynamic cable rating, and in the future, SPARTA (System Performance Availability Reliability Trend Analysis) aimed at improving operational performance.

²⁴ Evidence of award: <http://www.edpr.com/consortium-with-edp-renewables-is-selected-for-floating-wind-farm-pilot-project-in-france/>

²⁵ Evidence of membership: <https://ore.catapult.org.uk/who-we-work-with/industry/industry-advisory-group/>

6 SKILLS

6.1 Commitments Highlights

- 6.1.1 Moray East provides a cradle to grave approach to skills development.
- 6.1.2 Moray East commits to support the attraction of talent to the renewables industry through a Skills Summit and continuing ambassadorial work with students.
- 6.1.3 Moray East commits to developing the skills of external candidates through a programme of activities, such as internships, apprenticeships, a bursary scheme to support candidate(s) through a University engineering degree and support for masters and PhD students.
- 6.1.4 Moray East commits to developing opportunities to increase diversity within the workplace and continuing the training of internal candidates.

6.2 Skills Gap Analysis

- 6.2.1 **Issue.** The number of offshore renewables projects has increased substantially in recent years. However, the number of people with skills relevant to offshore construction are limited. Understanding the skills gaps and taking actions is vital to ensure a sustainable skills supply for the sector. Follow-up on the activities and progress is equally as important.
- 6.2.2 **Actions.** **1.** Moray East worked with Energy and Utility Skills and Skills Development Scotland (SDS) to model the future skills requirements for the Project and the wider offshore wind industry in Scotland (Annex 18). **2.** As shown in Annex 5, Moray East has also worked with suppliers and prospective suppliers to identify skills gaps relevant to the wider services required for the Project. **3.** As shown in Annex 19, Moray East has identified a range of positions anticipated to be difficult to fill, for which *Moray East commits to furthering discussions with relevant organisations (e.g. SDS and HIE) and other developers, in order to develop a sustainable recruitment pool.* Positions to be investigated include high voltage system Senior Authorised Persons (SAPs), commissioning engineers, control room operators, marine coordinators, and local vessel personnel. **4.** *EDPR-UK commits to establishing a Project Skills Committee to track progress, make recommendations for the Project and support the provision of contributions to industry skill groups.*
- 6.2.3 **Impacts.** **1.** Undertaking the gap analyses has various benefits for the Project, the supply chain and the wider renewables industry. Firstly, as highlighted in Annex 18, an understanding of the size of the potential employment market is provided. **2.** The size of requirements in combination with the analysis of positions/skills that will be difficult to fill are important for assisting EDPR/Moray East, the renewables industry (developers and suppliers alike) and relevant trade and Government bodies, to identify where efforts are best placed in developing and supporting the development of these skills. The following sections of this report outline the approaches that have and will be taken by Moray East/EDPR to develop a sustainable work-force relevant to

offshore wind and with transferrable skills relevant to the wider green generation industry. Moray East also inputs such information to relevant national skills groups thus sharing the experience to the benefit of the wider green industry. 3. As shown in Annex 19, the approach allows Moray East to encourage suppliers to engage with the local communities on training and recruitment needs, which should also provide local skilled personnel that have transferrable skills relevant to the Project O&M phase.

6.3 Developing and retaining a skilled workforce

6.3.1 The following paragraphs in this section describe the approaches EDPR/Moray East is taking in order to develop and retain a skilled workforce and the impacts these will have on the supply chain and wider industry.

6.3.2 **Issue.** With a limited recruitment pool of personnel experienced in offshore development projects, solely recruiting staff from oil and gas or other renewable projects does not develop a sustainable workforce, with counter-productive results through rapid turnover and unsustainable competition in employment contracts.

6.3.3 **Action.** EDPR-UK has a core team of staff which work across all projects within the EDPR offshore portfolio. In addition, Moray East staff are invited to partake in discrete actions on these projects and other due diligence exercises.

6.3.4 **Impacts.** This approach allows lessons learned and experience to be shared across projects and geographies within the EDPR portfolio. In addition, it is EDPR's strategy to establish these projects as joint ventures with industry partners. This collaborative, cross-project working fosters the sharing of the skills gathered "in-house" to be shared with other developers and vice-versa, spreading knowledge and lessons learned across the industry.

6.3.5 **Action.** As described in Annex 1, Moray East is adopting a multi-contract strategy for the Project, which originally involved the tendering of six EPCI work packages. This approach has an increased number of interface points between Moray East as the client and the various Tier 1 suppliers, compared to a traditional turn-key approach which relies on one main contractor delivering the entire project. Moray East has also appointed the consultancy RES to work on secondment, to help manage the procurement process within the in-house team.

6.3.6 **Impacts.** The increased number of supplier-client interfaces requires Moray East to focus on the detail of the skills required to deliver individual work packages and ensure coordination across all work packages. This develops the team's skills in design, engineering and project management and helps to develop young engineers by exposing them to a wide diversity of project issues. This approach also supports the skills development

- 6.3.7 **Actions.** Details of all internal skills development actions can be found in Annex 20. **1.** EDPR provides continued professional development through internal and external training opportunities. Internal training includes the EDP University system (established in 2011) which migrates EDPR's collective experience to employees with courses facilitating the sharing of experiences between onshore, offshore and solar photovoltaic projects. Contributors to this programme have included Moray East staff, to allow the transfer of knowledge of offshore experience throughout the company and upskill those interested in pursuing an offshore career. EDPR also offers an "Executive Development Programme", which is used to develop business and professional skills of which 6 people from Moray East have completed in the last 3 years. **2.** EDPR also runs a Trainee Programme, a form of graduate development programme which provides placements for promising graduates across a range of projects and geographies within the company. This increases their exposure to different challenges and problem solving for different types of renewable projects and political systems.
- 6.3.8 **Impacts.** The combination of initiatives has three critical impacts relevant to both Moray East as a project team and the wider renewables industry. **1.** Upskilling staff is a method of addressing the skills gaps that may exist within the external labour pool. This has facilitated the career change of internal staff across renewables disciplines. **2.** Motivating and challenging staff through upskilling and career development is important for ensuring job satisfaction and therefore staff retention. **3.** Staff are provided a wider understanding of the green generation industry and how to transfer experience across different disciplines within the energy sector.
- 6.3.9 **Actions.** Moray East /EDPR has supported staff to undertake extra-professional endeavours which supports the delivery of education in areas directly relevant to renewables. **1.** One of Moray East's staff has recently been awarded a four-year post on the management board of Moray College University of the Highlands and Islands²⁶. Moray College provides tertiary education including courses in business, engineering, science and the environment. This role will involve advising on the delivery of the curriculum and courses, the student experience and management of guiding students into the workplace. **2.** Since 2013, two of EDPR/Moray East's staff have been course authors/tutors for the Bureau Veritas and Spanish Maritime Institute (IME) Masters in Marine Renewables Energy²⁷.

²⁶ Evidence of John Yorston's appointment: <https://www.moray.uhi.ac.uk/about-us/management/meet-the-board>

²⁷ Evidence of Enrique Alvarez and Paula Low as tutors: <http://www.ime.es/site/en/on-line-courses/master-in-marine-renewable-energies.html>

- 6.3.10 **Impacts.** Supporting staff in such activities helps to develop and deliver much needed skills relevant not only to the offshore renewable industry but also the wider green economy. Such educational activities help to fill the skills gaps (section 6.2) as well as bring diversity to the labour market (section 6.4).

6.4 Diversity in the labour pool

- 6.4.1 **Issue.** To ensure a sustainable skilled workforce, it is important to ensure that the recruitment pool is as wide as possible. An internal audit by EDP found that 31% of the EDPR workforce is female, <25% hold senior management positions and no females are at board level (Annex 20). Although Moray East has workforce with 50% female staff, there is a lower proportion of females within the senior management team. Further, to date, only 10% of CVs submitted for job opportunities in Moray East are from women. The Project is adopting a two pronged approach to address this skills gap.

- 6.4.2 **Actions.** 1. EDPR-UK is supporting initiatives to encourage women to take Science, Technology, Engineering and Mathematics (STEM) subjects at Higher Education. *EDPR commits to offering staff from EDPR-UK the opportunity to join mentoring programmes which provide mentors for females entering and progressing within STEM careers.* EDPR-UK has also engaged in the 2014 Women In Renewable Energy Scotland (WIRES) mentoring programme²⁸, which supports women enter or develop their renewables career and will invite EDPR-UK staff to partake as mentors in any future programme. 2. To retain and develop the skills of females within the workforce, *EDPR-UK commits to encouraging female staff to attend relevant external skills workshops, e.g. the career enhancement programme and sticky floor-glass ceilings²⁹.* These workshops support females in STEM subjects enhance their communication skills and leadership potential. 3. *EDPR-UK commits to ensure diversity issues and barriers to womens' development are understood across the whole team and women encouraged to join networking groups, such as WIRES and Equate-Scotland.* 4. EDP, EDPR's parent company, is developing a Diversity and Inclusion programme focusing on gender, disability, nationality and age. EDPR-UK is working with EDP, drawing from the actions, commitments and contacts to help develop the initiatives within this programme.

- 6.4.3 **Impacts.** 1. Encouraging more women to engage with STEM subjects increases the potential pool of labour with higher education available to the green energy sector. 2. The act of mentoring supports the development of key leadership "soft-skills" for both the mentee and mentor, including people management, active listening and assertiveness. Developing communication and leadership skills are also important for supporting the development of females already within the workplace. 3. Promoting the building of networks within the renewables industry will help

²⁸ <https://www.closethegap.org.uk/content/resources/CtG-Women-in-Renewable-Energy-Scotland---What-businesses-can-learn.pdf> (page 2 provides evidence of the mentoring programme)

²⁹ Evidence of workshops available: <http://www.equatescotland.org.uk/women/workshops>

support knowledge exchange and potentially, retention of talent within the renewables industry should staff decide to move on. **4.** The development of the EDP Group Diversity and Inclusion programme will support the development of diversity and soft-skills throughout EDP's wider energy generation portfolio (including electricity, gas, hydro, onshore wind, offshore wind and solar photovoltaics) across all the different geographies including the UK in which the Group works.

6.5 Developing external candidates' skills.

6.5.1 **Issue.** Upskilling internal staff is not enough to address the skills gaps identified in section 6.1, and as recognised, there is currently a shortage of potential candidates with suitable experience and skills for offshore wind projects.

6.5.2 **Actions.** **1.** Moray East employs interns to provide them with industry experience, and, importantly to identify new permanent members of the Moray East team. Since 2012, 28 interns have been placed with Moray East on the Environmental Placement Programme (EPP)³⁰ and five were permanently retained within the company. Moray East is currently further developing the internship programme and *commits to continuing to recruit interns throughout pre-construction and construction.* **2.** As evidence in Annex 21, Moray East has hosted a number of Masters projects for students attending the University of Edinburgh's Masters in Carbon Finance and the Executive MBA Programme and *commits to continuing this engagement through the pre-construction and construction phases of the Project.* **3.** Moray East has been working with the University of Edinburgh to identify opportunities for supporting the development of the Industrial Doctoral Centre for Offshore Renewable Energy programme. As evidenced in Annex 21, *Moray East is committed to furthering this relationship and identifying the potential for supporting a Doctoral student within the Project.* **4.** *EDPR-UK is committed to developing an apprenticeship programme supported by the Tier 1 suppliers, to support resourcing within the Project.*

6. Moray East commits to ensuring that the apprenticeship programme make provisions to support diversification.

6.5.3 **Impacts.** Supporting the development of students in their course theses or through hosting of research positions has three main benefits: a. The research work furthers innovation which will have cost benefits to the Project and where suitable, will be published in peer reviewed journals, thus sharing the knowledge with the wider industry; b. The experience gained through the research work, or through permanent positions taken up with Moray East, increases students'

³⁰ Evidence of EDPR hosting placements: <http://www.brightgreenbusiness.org.uk/environmental-placement-programme-epp-national-final-2013/>

skills and experience of the renewables industry which in turn benefits the wider industry and develops a larger and more sustainable pool for recruitment; and c. Moray East and EDPR benefit as a company as placements provide a more in-depth assessment of the potential of candidates compared to standard interviews. In addition, supporting talent in under-represented groups and through Modern Apprenticeships will further increase the diversification of skilled, experienced labour available to Moray East and other companies within the renewables industry.

6.6 Attracting people to the renewables industry

6.6.1 **Issue.** Ensuring a sustainable pool of skills needs more than training and experience, it also requires a pool of people wanting to work within the renewables industry.

6.6.2 **Actions.** Evidence of actions taken is presented in Annex 22 and/or footnotes. **1.** Since 2010, Moray East has encouraged staff to work as ambassadors for STEM programmes, such as HIE's Go4SET. Through this programme staff have worked with a range of primary and secondary schools, supporting the curriculum and promoting the opportunities associated with offshore wind. **2.** Since 2013 EDPR has funded a Green Education programme in the Moray Firth area which provides grants to promote the education of children from households with low incomes. **3.** Moray East has and *will continue to give presentations and workshops at Universities, highlighting the opportunities within the renewables industry.* **4.** In 2011, Moray East held a "Skills Conference" hosted by HIE, highlighting the project skills requirements and timelines. Attendees included representatives from universities, colleges and local authority education departments from Highland, Moray and Aberdeenshire³¹. *Moray East commits to holding a follow-up event following award of CfD to the Project and will include skills required by both the Project, its suppliers and licensing stakeholders.* **5.** Moray East is also working with the Career Transition Partnership to identify opportunities for recruiting ex-servicemen to the renewables industry. This work includes reviewing and providing feedback on speculative CV's, posting job adverts on their recruitment portal, attending the career fairs and Moray East will hold a workshop with suppliers on the opportunities within the industry.

6.6.3 **Impacts.** These initiatives work to influence career choice across all age levels: influencing children to consider STEM subjects at school and then as apprentices or at University; encouraging students to consider choosing renewables for their career; and encouraging those with significant professional experience to consider transferring those skills and experience to the renewables industry. These initiatives benefit all sectors of the renewables industry, advisors, suppliers and developers alike.

³¹ Evidence of the Skills Conference held: <http://morayoffshorerenewables.com/News/Offshore-Wind-Skills-Conference-Held-in-Inverness.aspx>

6.7 Supporting the development of the supply chain workforce

- 6.7.1 **Issue.** It is important for Moray East and the wider renewables developers group to ensure that the supply chain supporting the Project also has a sustainable recruitment pool of experienced and skilled candidates.
- 6.7.2 **Actions.** **1.** Moray East has supported 4 meet-the-buyer events, at which the skills needed by the Project have been communicated across the length and breadth of the supply chain (see section 4.5.2 and Annex 10 for event details). The events were supported and attended by HIE, SE, DECC, UKTI and Tier 1 suppliers. Local companies were provided direct access to such organisations to understand the support mechanisms available to them for developing their workforce. *Further events will be held post-CfD.* **2.** Moray East requires all EPCI Tier 1 suppliers to submit SCPs as part of their offers for EPCI contracts. *The contracts for the EPCI work packages will make the commitments of these SCPs, including those for skills development, contractually binding.* See section 6.8 and Annex 5 for information on skills commitments currently offered by preferred bidders. **3.** As shown in Annex 9 and discussed in section 6.7.4, Moray East is supporting identifying and developing offshore renewables training opportunities for [REDACTED]³².
- 6.7.3 **Impacts.** Moray East's actions are supporting the development of a sustainable supply chain skills pool, benefitting not only contracted suppliers but also the wider industry (suppliers and developers alike). The north-east of Scotland is also known for its skills in oil and gas and the marine environment. Meet-the-buyer events, contractual commitments to deliver SCPs and fostering the training of fishermen to work more closely with the renewables sector will help support the migration of these skills into the offshore renewables supply chain. This has already happened, with the appointment of GEG to support the OMM contract, which was their first offshore renewables contract (section 4.5.3).
- 6.7.4 **Action.** Since 2010, Moray East has worked with and engaged the [REDACTED] to provide vessels and personnel for surveys. [REDACTED] SMEs and new entrants to the offshore wind industry. As shown in Annex 8, Moray East has signed a MoU which aims to help further the development of the breadth of services on offer. As shown in Annex 9, these services could include [REDACTED]. Moray East is working with [REDACTED] to support their development of these services, which has included introducing [REDACTED] to SDS. [REDACTED].

6.7.5 **Impacts.** Since entering into the MoU in 2014 Moray East has contracted 15,744 man hours and just under 70 days [REDACTED] vessel time from [REDACTED]. During times of reduced quotas, the further development of the services offered by [REDACTED] could increase the number [REDACTED] who could benefit from diversification and maximise on new opportunities in the offshore market.

6.8 Actions by Moray East Suppliers

6.8.1 **Issue.** Developing skills within the Wind Turbines sector

6.8.2 **Actions.** [REDACTED] commitments to skills development are summarised below and provided in full in Annex 5:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

6.8.3 **Issue.** Developing skills within the Substructures sector.

6.8.4 **Actions.** [REDACTED] commitments to skills development are summarised below and in Annex 5:

[REDACTED]

[REDACTED]

[REDACTED]

6.8.5 **Issue.** Development skills within the Transmission Infrastructure sector.

6.8.6 **Actions.** [REDACTED] commitments to skills development are summarised below and provided in Annex 5:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]