VATTENFALL

SCOTTISHPOWER RENEWABLES

East Anglia ONE Offshore Windfarm

500MW – 600MW Project

Supply Chain Plan

August 2014

Background & disclaimer

This document is a Shortened Version of the Supply Chain Plan submitted by East Anglia ONE Ltd ("EA1") to the Department of Energy and Climate Change in August 2014.

This version includes a number of amendments to the Full Version of the Supply Chain Plan submitted to make the document suitable for publication. The principal changes made to prepare this Shortened Version are the redaction of any content that is commercially sensitive, confidential, otherwise restricted, or may prejudice EA1's future procurement activities. EA1 has sought to be as transparent as possible in this publication and shall look to disclose further details of the redacted items where appropriate at future milestone dates of publication.

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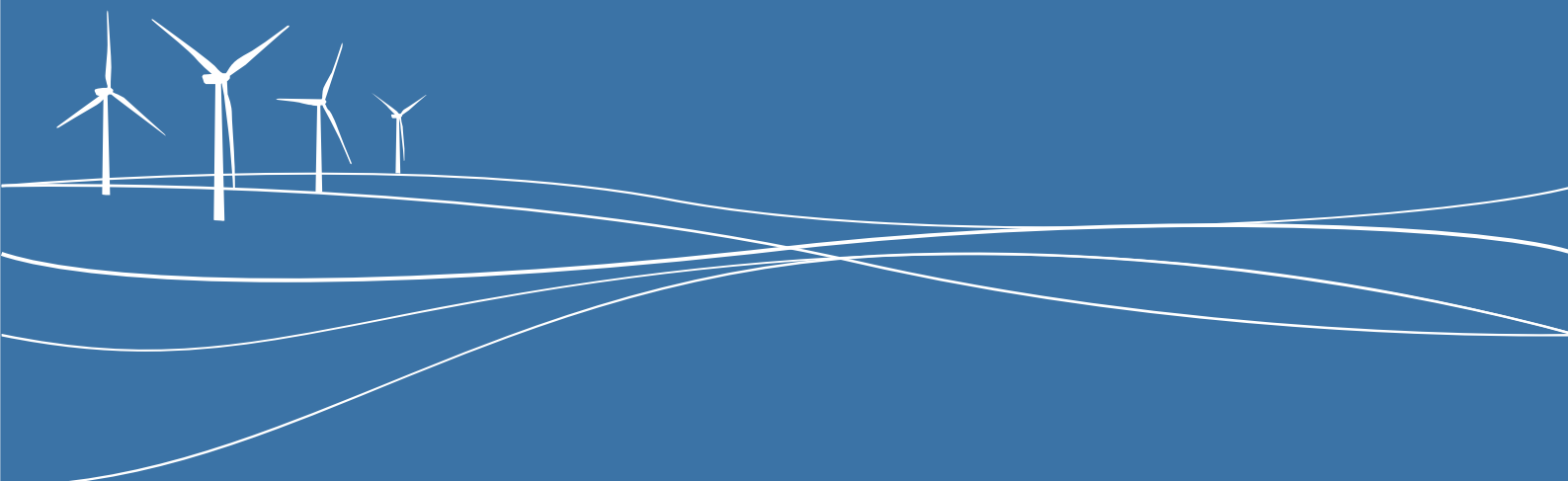

East Anglia ONE Offshore Windfarm Supply Chain Plan

By East Anglia ONE Ltd, a joint venture between ScottishPower Renewables and Vattenfall.

For the Department of Energy and Climate Change, August 2014.

Contents

Project Summary

Table 1 Contact details.

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Table 2 Project details.

Project name	East Anglia ONE	Project size (in MW installed capacity)	500MW – 600MW
Project commissioning date	31 March 2019	Project location	South East Area of the Round 3 East Anglia Zone, covering approximately 300km^2
Is supply chain project plan included?	Yes	Ownership structure	ScottishPower Renewables (UK) Limited 50%, Vattenfall Wind Power Limited 50%
Maturity of project	The East Anglia ONE offshore windfarm (The EA1 Project) has planning consent and a grid connection agreement for December 2018. Engineering work has commenced and supplier pre-qualification activities are complete for a number of packages with certain tenders already underway and others to commence in 2014/2015 to enable progress in line with DECC requirements. To date around £64M has been spent on the development of the EA1 Project. The expected date of construction start is 2017 with first power export in 2019. East Anglia ONE Limited intends to apply for a Contract for Difference (CfD) during the first allocation window in October 2014. Due to the long lead time on the procurement of the HVDC transmission system, it is critical for the timely development of the whole zone that the first phase is awarded a CfD at the earliest opportunity. An investment of over £2billion will be required to complete the EA1 Project representing an opportunity to create significant UK economic benefit. This will be the first project in a zone which has the potential to deliver 7200MW. The investment in the EA1 Project would be the first investment in the zone which if fully delivered could result in a further £22billion investment making this one of the largest and most important renewable generation projects in the world.		

1 Introduction

1.1 East Anglia One Offshore Windfarm

1.1.1 The EA1 Project is being developed by East Anglia ONE Limited (EA1), which is a joint venture between ScottishPower Renewables (UK) Limited (SPR) and Vattenfall Wind Power Ltd (Vattenfall). SPR is the UK's leading onshore wind developer and is part of the Iberdrola Group which is one of the world's largest utility companies and the global leader in wind energy. Vattenfall is a subsidiary of the Swedish energy utility which has one of the largest portfolios of offshore wind plant in Europe.

1.1.2 The EA1 Project is the first of up to twelve projects in the East Anglia Round 3 zone (EA Zone), one of the largest offshore wind zones for development in Europe. The zone has very favourable conditions including the lowest water depths on average in Round 3, convenient location near demand centres and benefits from good wind conditions – hence, it offers from its first project to the last an unparalleled opportunity, anywhere in the world, to progressively drive down the cost of offshore wind.

1.1.3 At between 500-600MW in size, the EA1 Project will be one of the world's largest offshore windfarms. This presents an excellent opportunity to drive competition, innovation and skills.

1.1.4 EA1's track record in helping to drive forward the UK Offshore Wind industry is demonstrated by its parent organisations providing:

- The original Chairman of the Government-proposed Offshore Wind Cost Reduction Task Force, the Offshore Wind Developers Forum and the Offshore Wind Industry Council (OWIC)
- The key industry lead link for the development of the Government's Offshore Wind Industrial Strategy
- The current lead for the O&M work stream of the Offshore Wind Programme Board (OWPB)
- A former Chairman of RenewableUK, representatives on its board and its Offshore Wind Strategy Group
- A board member of the G9 Industry Health and Safety Group.
- A member of the TSB Offshore Renewable Energy Catapult (ORE Catapult) Industrial Advisory Group
- A Director of the East of England Energy Group (EEEGR)

1.2 Aid to use of this document

1.2.1 Where a specific impact criteria, specified in DECC guidance, is addressed then this is referenced using the codes for example [C1] defined in Annex 1. Note that in some cases, impact criteria under competition, innovation and skills are all addressed by the same action that is stated only in one place, so any assessment of one criterion requires review of all sections.

1.2.2 DECC's intent to assess this plan against the three criteria, noted below, is also recognised:

(i) The commitments or actions undertaken or planned
(ii) Impact on the supply chain as a whole
(iii) Impact on the wider relevant low carbon electricity generation industry

To aid scoring, {ii} or {ii, iii} have also been added to identify where the impact of actions fall.

1.2.3 In many instances the actions and planned actions stated in the plan are by Iberdrola, ScottishPower, SPR or Vattenfall. EA1 directly benefits from these actions through its relationships as a joint venture and the sharing of knowledge via Iberdrola, ScottishPower, SPR and Vattenfall employees involved in the Project.

1.2.4 Any supporting evidence provided in the Annexes is referenced directly in the text. Where abbreviations have been used definitions have been provided in Annex 11.

2 Competition

2.1 Overview

2.1.1 ***Targets*** **-** EA1 has set the following UK content and competition targets for the EA1 Project:

- The delivery of 50% UK content over the life of the EA1 Project
- Laying the groundwork for further increases to 55% UK content over the life for the next 3GW of EA Zone projects and 60% for the remaining 3.6GW of the zone
- All major contract packages to be competitively tendered

2.1.2 ***Project Scale and Potential*** **-** The size, timing and scope of the EA1 Project mean that it will naturally have a significant positive impact on competition on the offshore wind sector: [C1,C2,C3,I3,I4,S3] {ii,iii}

- At between 500MW - 600MW, the EA1 Project offers sufficient scale to attract new entrants into the market
- The 2019 delivery period is perfectly timed to take advantage of new Wind Turbine Generator (WTG) models in the market
- The number of jacket foundations required (75 – 85 units) will help support existing suppliers to invest in new facilities & tooling and entice new suppliers into the market
- The physical scale and volume of components being purchased and the duration of the installation phase should support investment in new vessels and port facilities and will help to improve project efficiency and cost
- The fact that this may be the first UK offshore project to use an HVDC Grid connection will offer opportunities for UK inward investment to build on the UK's current engineering expertise in this field
- This is the first of between six to twelve physically similar projects in the EA Zone. It offers from its first project to the last an unparalleled opportunity, anywhere in the world, to progressively drive down the cost of offshore wind and gives long term market visibility to the supply chain to drive industrialisation, learning and competition.

2.1.3 ***Parent Company Experience*** **-** SPR and Vattenfall, own 13 offshore windfarms in operation or under construction, rated at a total of 1.4GW (Annex 2A) and are also developing 17 offshore windfarms, with capacity of 9.8GW (Annex 2B). The parent companies also develop, construct, own and operate over 100GW of other generating plant. This considerable expertise is available to EA1 in developing the supply chain to improve competition, innovation and skills. [C3,I6,S5] {ii}

2.1.4 The following sections (Sections 2.2 to 2.9) describe actions generic to all packages and specific actions to drive competition for each tender package. In each section, EA1 addressed the impact of these actions on the project but also both on the offshore wind supply chain as a whole and on the long-term low carbon energy generation industry.

2.2 Supporting New Market Entrants [C1]

2.2.1 ***Progress to date –*** Iberdrola, SPR, Vattenfall and EA1 have already shown willingness to contract with new entrants to the sector. This is evidenced by the following: [C1,C2,C4,C5] {ii, iii}

- The award of the EA1 Project's largest contract to date with UK company Wood Group for the supply of two offshore met masts – encouraging an oil & gas contractor into the offshore wind sector (£17M). Case study in Annex 3.1.
- Selection of BiFab, at the time a relatively new supplier to the offshore wind industry, as steel jacket fabricator on Vattenfall's Ormonde Project.
- Deployment of Senvion's first offshore wind turbines on the Ormonde project.
- Iberdrola's choice of Navantia, a new market entrant, as one of the foundation fabricators on its Wikinger project. Case study in Annex 3.2.
- As part of the West of Duddon Sands (WoDS) Project, SPR and DONG Energy (DONG) made a lease commitment with Belfast Harbour which resulted in an investment of £50M to upgrade this facility. Case study in Annex 3.3.
- The charter commitment to Swire Blue Ocean made as part of SPR's WoDS project to support the Pacific Orca (a new installation vessel) coming to market. Case study in Annex 3.4.

2.2.2 ***High volume of new entrants engaged –*** Across all of the major construction packages set out below in 2.10.1, EA1 has engaged 253 suppliers to date as part of its early and broad market engagement activities. Of this total 167 (66%) are either less established or are new to the offshore wind market. A full listing of these suppliers and definitions regarding our classifications is provided in Annex 4 [redacted]. Many of these potential suppliers are from other industries such as oil & gas and also different geographic locations. [C4,C5] {ii, iii}

2.2.3 ***Ongoing engagement activity –*** As part of this engagement EA1 has (and will continue to):

- Make prospective suppliers aware of the supply opportunities and provide the suppliers with a chance to demonstrate willingness and capability to be considered as part of the pre-qualification process, discussed further below. [C1,C4] {ii}
- Provide newcomers with relevant information and timely engagement with the right people. [C1]{ii}
- Work with bodies such as the Offshore Wind Investment Organisation, UKTI, Scottish Enterprise and Scottish Development International to identify the valuable public support available for potential suppliers to the sector. A list of key enabling organisations relevant to EA1 in developing its supply chain is in Annex 2C. [C1,C2,I6,S5] {ii, iii}
- Maintain a working knowledge of the key investment decision criteria for credible potential suppliers
- Ensure that each has a specific point of contact within EA1 to engage with about the EA Zone projects. [C1,C4,C5] {ii, iii}.

2.3 Removing Barriers to Entry into the Supply Chain [C2]

2.3.1 ***Existing activity to remove barriers to entry –*** Some examples of EA1 activity include:

- Helping to overcome constraints (e.g. balance sheet, track record, know-how etc.) by encouraging partnering between potential new entrant UK companies and other companies with requisite balance sheet, track record or experience. Evidence of EA1's activity in this area is supported by the memorandums of understanding (MOUs) EA1 has included in Annex 8 [redacted] and is further described in 2.14.2. EA1 expect these strong joint ventures to be well positioned to be able to deliver large projects, create UK economic benefit and strengthen the business for future opportunities both in the UK and Internationally. [C2,C4,C5] {ii, iii}
- Assessing options promoted by BIS & UKTI prior to making final selection decisions, recognising Government intent to better use export credit arrangements to support UK manufacturing companies and the Business Bank (action 24 in the Offshore Wind Industrial Strategy). [C2] {ii}

2.3.2 ***Test site opportunities to prove new technologies and increase competition***:

- EA1 is planning to use a small area (3 to 5 turbine locations) of the EA1 Project as a demonstration site for turbines (of the generation after those listed in 2.12.2) and foundations, in order to reduce barriers to entry for new turbine and foundation models and accelerate competition for future offshore wind projects including the wider EA Zone. EA1 has already discussed this proposal with the Crown Estate. [C1,C2,I1,I2,I4,I5,S4] {ii, iii}
- SPR is already showing commitment to promoting competition by developing one of the largest test sites in the world adjacent to its Wikinger offshore wind project in Germany. SPR has applied for a BSH 1 award (a necessary consenting milestone for German offshore windfarms) and is currently awaiting approval. Once consented this project will have up to 11 test pads available for turbine installation in 2016. This should enable EA1 to gain operational insight with its chosen turbine in a cost effective manner before the supplier purchases components for the EA1 Project. [C1,C2,C3,I1,I2,I4,I5,I6,S4,S5] {ii, iii}
- Vattenfall has already shown significant leadership in driving the development of European Offshore Wind Deployment Centre (EOWDC) off the coast of Aberdeen in Scotland as a key close-to-shore location to accelerate supply of new turbines and other areas of supply. This project is now awaiting the conclusion of a Judicial Review of its consent and onshore consent for the cable coming ashore.
- Vattenfall also helped develop and part owns Alpha Ventus which was the first German offshore wind demonstration site in 2010 with six AREVA M5000 turbines and six Senvion 5M turbines. [C1,C2,C3,I1,I2,I4,I6,S5] {ii, iii}

2.3.3 ***Operations and Maintenance (O&M) approach to reduce barriers***: For the O&M phase, EA1 has taken steps to ensure that barriers to competition and market entry are removed by ensuring that (i) it has sufficient access to data and Intellectual property in order to be able to take operational control of the Project at any time; (ii) it provides a number of technicians to be fully trained in service and maintenance activities by the Original Equipment Manufacturers (OEMs), but remain as EA1's staff; and (iii) have access to key components. This should reduce the dominance of OEMs in the O&M phase and allow EA1 to open the operation and maintenance contracts to potential third party suppliers in a more competitive environment. [C2] {iii}

2.4 Sharing Best Practice and Lessons Learned [C3]

2.4.1 ***Parent expertise –*** EA1's parent organisations have considerable expertise in the offshore wind sector (Annex 2A, 2B) and wider electricity sector. This experience is already being shared with EA1, for example:

- The contract strategy in relation to WTG supply and installation and in relation to Foundation Design, Supply and Installation as multi-contracts has been influenced by lessons learned on SPR's Wikinger project which adopted a similar contracting strategy. [C3] {ii}
- The approach to the array cable supply and installation packages has been influenced by lessons learned from SPR's WoDS and Wikinger projects. [C3] {ii}
- More generally, helping determine the appropriate risk allocation between EA1 and contractors to reduce costs. [C3] {ii}

2.4.2 ***Sharing lessons learned with supply chain –*** We are sharing lessons learned from previous SPR and Vattenfall offshore projects with EA1's chosen suppliers, seeking their learning in return, to enable development of more vertically and horizontally integrated approach to delivery. For example:

- Sharing lessons learned as part of the optimisation work streams that are already underway with shortlisted WTG suppliers (discussed further in 3.3.2).
- Reviewing the experience of EA1's shortlisted grid transmission package suppliers to consider learning from HVDC projects deployed to date in the German North Sea.
- Engaging with EA1's chosen foundation designer to standardise and simplifying aspects of the design for fabrication and installation using learning from the Wikinger and Ormonde projects. [C3,I6,S5] {ii, iii}

2.4.3 Once suppliers are chosen, EA1 will expand this process to ensure engagement across packages, exploring interfaces at an early stage, both with respect to opportunities for shared benefit as well as with respect to reducing risk. [C3, I6, S5] {ii, iii}

2.4.4 ***Participation in industry forums –*** EA1, via its parent companies, has a leading presence on the following forums:

- the OWPB;
- the RenewableUK Board;
- ORE Catapult Industrial Advisory Group;
- Strathclyde University's Technology Innovation Centre (TIC);
- the EEGR; and
- Offshore Wind Accelerator (OWA) Steering Committee.

SPR, Vattenfall and EA1 use these forums to raise awareness of opportunities with members of the supplier community as well as share best practice and lessons learned. [C3, C4] {ii}

2.4.5 EA1 and its parent companies also actively participate in numerous events and activities designed to promote best practice, such as: [C3] {ii,iii}

- OWPB developer days
- Offshore Transmission Standardisation workstream
- Leading an industry wide OWPB O&M workstream

2.4.6 Finally, to further share best practice, EA1 will enter discussions with other East of England Developers/Operators with a view to forming an "East of England Operator group" which would offer a means for developing an efficient pipeline of local suppliers during project construction and operation. [C3,C1,C4] {ii, iii}}

2.5 Improving Awareness of Commercial Opportunities [C4]

2.5.1 ***Using conferences and industry events –*** EA1 has actively promoted its supply chain opportunity to potential suppliers through presenting at the following industry and stakeholder events: [C4] {i}

- Renewable UK Offshore Wind conference, June 14, Debate - Offshore Wind in a Competitive Market, Glasgow, June 2014
- EWEA Conference, Barcelona, March 2014 – Panellist, Industry leaders debate
- Scottish Renewables Offshore Supply Chain Conference, Aberdeen, January 2014 – Supply Chain Alliances
- South North Sea Conference 2014 Cost of Energy challenges – Offshore Wind
- EWEA Global Offshore Wind Conference, 'The challenge of competitiveness' presentation and other panel events, Frankfurt, November 2013
- Presentation of Iberdrola offshore projects – French trade commission, October 2013
- Renewable UK Offshore Wind, June 13, Chairing and presenting at the Share Fair Event
- UKTI Madrid, February 2013, "Iberdrola Projects in UK Offshore"
- Jiangsu Development and Reform Commission Delegation, November 2012, "Offshore Wind Overview"
- Infrastructure Journal Renewables Forum, March 2010 "Offshore Wind Supply Chain, A Developer's Perspective"
- Maritime Industry Conference, February 2010 "Offshore Wind Supply Chain"

2.5.2 ***Local supply chain events –*** EA1 participates at many supply chain events local to the project. Through the Board of the EEEGR, EA1 supports their events programmes to bring together suppliers from the oil & gas, wind, bio-energy and nuclear sector to understand future project opportunities. EA1 will complement this activity by engaging further with other relevant bodies that represent the UK renewables, oil & gas, shipbuilding, ports sectors and regional and local industry bodies so that their members are aware of pre-qualification opportunities. [C1,C2,C4,C3,C5] {ii}

2.5.3 ***Share Fair events –*** A second share fair event (following the RUK share fair presentation In June 13, 2.5.1), this time organised by EA1, will take place in Norwich during October 2014. At the event, EA1 will set out its supply chain opportunities and bring together a selection of potential tier 1 suppliers and connect them with tier 2 and below suppliers. This will enable local and UK suppliers to understand how to pre-qualify with their potential future customers and EA1 will re-enforce the importance of local and UK content to its tier 1 suppliers. This event will be followed by a series of other events as the tender processes for each of the major packages develop. Both SPR and Vattenfall will use experience in delivering similar events from their onshore wind developments to inform the format of the session. [C1,C2,C3,C4,C5] {ii}

2.5.4 ***Information Packs –*** EA1 will also provide basic information packs to interested suppliers in October 2014, incorporating a link to, "A Guide to an Offshore Windfarm", published on behalf of The Crown Estate and headlines of generic requirements for different areas of supply to enable suppliers to establish their suitability to supply, both from a technical and commercial perspective. [C1,C4] {ii}

2.5.5 ***Use of EA1 Website –*** EA1 operates a project-specific website (www.eastangliawind.com) to support its market engagement activities. This is being used for the following purposes:

- ***Supplier interest registration***: The website allows suppliers to register their interest with EA1. By June 2014 a total of 183 prospective suppliers had registered, of which 148 (81%) are based in the UK. Although EA1 will not contract with many of these companies directly, it is committed to sharing this information with shortlisted tier 1 suppliers at an appropriate stage to enable their involvement.
  EA1 will issue a communication to the registered suppliers in September 2014 providing an update on the status of the project and also setting out EA1's intention to provide their details to the shortlisted suppliers for key packages at a suitable time for consideration.
  The registered suppliers will also be invited to the forthcoming share fair events being planned for later this year as discussed in 2.5.3. [C1,C2,C4,C5] {ii}
- ***Providing information about the projects procurement strategy & status***: The website is being updated to explain EA1's contracting strategy, procurement process, pre-qualification opportunities and timeline to help suppliers to engage at the right time at the right level. This will show the procurement status of tier 1 packages and a list of tenderers and shortlisted parties (where

commercially appropriate). EA1 will make it a condition that tier 1 suppliers provide contact details for their sub suppliers so that potential sub suppliers can make contact with the companies they would contract with. [C1,C2,C4,C5]{ii, iii}

2.5.6 ***Supporting Government bodies –*** EA1 will continue to support BIS/UKTI/Scottish Enterprise to promote opportunities for investment in the UK to satisfy the growing offshore wind market. EA1 has participated at a number of overseas events to promote the opportunity and assists wherever possible in connecting overseas business with potential UK partners. This is supported by the actions EA1 is taking in the foundations market to connect supply chain partners (see 2.14.2). [C2] {ii, iii}

2.6 Encouraging Competitive Procurement Processes [C5]

2.6.1 ***Structured and open procurement processes –*** The dominant way that EA1 will drive competition is through its structured and open procurement process, described below (2.6.3). Through this, EA1 will broaden and increase the robustness of the supply chain and thereby, manage costs, minimise long-term supply chain risk, and help establish a sustainable industry, providing significant national benefit. [C1,C2,C3,C4,C5] {ii, iii}

2.6.2 For each of the main packages we run a structured procurement process, facilitated by EA1's Supplier Relationship Management tool, driven by the objectives of maximising competition, both short-and long-term, and minimising shared risk. The attached project programme (Annex 7) shows how use of the procurement process fits with DECC timescales to deliver the EA1 Project in an efficient manner. Also provided in Annex 10 [redacted] is information on future financial commitments which complement the project programme. [C4,C5] {ii}

2.6.3 EA1's procurement process follows 5 key stages set out below:

1. Market engagement & strategy determination
2. Pre - qualification
3. Long list – formal tender launch
4. Short list
5. Supplier award

Brief comments on each phase are set out below:

2.6.4 ***Market engagement & strategy determination*** **-** Thorough consideration is given to identify existing and potential suppliers in the market to inform the procurement strategy for each product and identify the widest pool of suppliers to compete in the tender process. EA1 has a strong track record of engaging the market to ensure that new entrants have the opportunity to participate in the procurement process (as indicated in 2.2.2). The key considerations to identify potential suppliers include: [C5] {ii}

- SPR and Vattenfall's experience on other offshore wind projects
- Existing supplier contacts
- Desktop research
- Attendance at industry and stakeholder events
- Supplier portal registrations

The key outputs from the market engagement process are the agreed procurement strategy for the product and a list of suppliers to include in the next stage – Pre Qualification.

2.6.5 ***Pre-Qualification Phase –*** The pre-qualification phase allows the project to assess the capability of each supplier to determine the most credible parties to engage in the formal tender process. Pre-qualification is enabled by the supplier responding to a pre-qualification questionnaire (PQQ) which sets out various technical, health and safety and commercial enquiries. For development contracts placed to date EA1 has enquired of the UK content of each supplier's submission and considered this element as part of the PQQ assessment criteria. We are also giving assessment consideration to the supplier offerings in terms of UK content, competition, innovation and skills as part of the evaluation process for major construction packages as described in 2.8.1. [C5] {ii, iii}

2.6.6 ***Long list & Short list –*** Following PQQ assessment the most credible potential suppliers will be included on a long list to participate in the formal tender process and be issued an Invitation to tender (ITT). The ITT sets out the specific scope of works and terms and conditions that a supplier offer is requested for. Following

evaluation of supplier offer responses EA1 will often reduce the supplier field to a short list to allow for a best and final offer request for further negotiation ahead of determining the winning supplier. [C5] {ii, iii}

2.6.7 ***Supplier selection criteria –*** EA1's supplier selection process entails the assessment of the supplier's offer against criteria which includes an evaluation of health and safety, commercial and technical compliance. The same criteria are used for every supplier involved in the tender. [C1,C5]{ii}

2.7 Increasing UK Content

2.7.1 ***UK Content target –*** As noted in paragraph 2.1.1, EA1 has set a target of 50% UK content for the EA1 Project, with this target increasing to 55% & 60% for the future projects in the EA Zone. EA1 will collaborate closely with its chosen suppliers as described in 2.11 to 2.19 below to achieve these targets.

2.7.2 ***Continuous Assessment of UK Content -*** An indication of the UK content related to each package over the life of the windfarm is set out in Annex 2D. Based on EA1's projection of supply chain choices today this shows a lower and upper UK content range of 40% to 52% of UK content over the life of the EA1 Project and supports delivery of EA1's 50% lifetime target. These projections are made using the methodology that is likely to be approved by the OWIC. [C1,C2,C3,C4,C5,I3] {ii, iii}

2.7.3 ***Contractual enforcement of UK Content Methodology –*** Built in to all EA1's tendering will be the requirement for suppliers to estimate their UK content in line with 2.7.2, and to cascade this requirement down their supply chain as appropriate. This means that at Final Investment Decision (FID) EA1 will have a full picture of UK content for the EA1 Project and progress against the 50% target. EA1's contracts will also require that suppliers report UK content upon request. This will further drive a broadening of the UK supply chain and materially affect barriers to entry. [C1,C2] {ii, iii}

2.8 Reinforcing Key Principles of Competitive Criterion in the Supply Chain

2.8.1 ***Provision of Supply Chain Plans from key suppliers –*** Once a shortlist of potential suppliers is established, EA1 requests supply chain plans from each supplier demonstrating how they will deliver competition, innovation, skills and UK economic benefit. Tier 1 suppliers are then requested to do the same to any major tier 2 suppliers where opportunities exist in turn to drive changes in behaviour that would be in line with UK Government intent. EA1 has started to see how these requests drive communication and focus right through the supply chain. [C1,C2,C3,C4,C5,I1,I2,I3,I4,I5,I6,S1,S2,S3,S4,S5] {ii}

2.8.2 ***Contractual recording of Supply Chain Plans in MOUs –*** EA1 has already received Supply Chain Plans from potential tier 1 suppliers and has entered into MOUs (see Annex 8 [redacted]) with these parties to make clear its commitment to delivery of these plans. All tier 1 suppliers will need to present such a plan in their final tender submission and EA1's final selection of bidder will be influenced by their response. [C1,C5] {ii, iii}

2.8.3 ***Continued follow up on Supply Chain Plans –*** After selection, EA1 will continue to provide resource and challenge to help its tier 1 suppliers maximise the benefit of their supply chain plans presented. EA1 will do this by dedicating resource and establishing evaluation milestones to help monitor and review the delivery of these plans with the chosen suppliers. [C1,C2,C3,C4,C5,I1,I2,I3,I4,I5,I6,S1,S2,S3,S4,S5] {ii, iii}

2.9 Impact

2.9.1 The actions described above address all of the criteria relating to competition, as outlined in Annex 1. EA1 is using opportunities provided by such a large project at between 500MW - 600MW utilising the most innovative supply chain choices (such as HVDC, higher voltage array cables and next generation WTGs) to implement actions that either would not be possible or would have a lessor impact on a smaller project.

2.9.2 The key impacts of the EA1 Project are:

- New investment in UK manufacturing facilities for turbine components and component volumes to help foundation and cable suppliers move closer to realise their investment plans, with the extent of this dependent on suppliers chosen and decisions taken on other projects. {ii, iii}]
- Provision of a further offshore test site, dependent on any further external approvals required. This can be used to test a range of windfarm components, including turbines and foundations. {iii}
- Very significant supply opportunities due to the scale of the project and the technology choices made, with increased accessibility to new suppliers through more open procurement practices. {ii, iii}

- Improved awareness of supply opportunities throughout the supply chain and increased clarity on how to access these. {ii, iii}
- Improved sharing of best practice and lessons learned, both internally, vertically within EA1's supply chain and horizontally across the industry. {ii, iii}

2.9.3 EA1 has considered the impact of EA1 on the wider industry in detail for six different types of project, as described in Annex 6, where the impact of 18 specific groups of actions are considered. Headlines of impacts on these six types of project are:

1. **Other EA Zone windfarms:** The EA1 Project has the potential to have a very significant effect on these, due to synergies in geography, technology need and ownership. All of the supply chain development, good practice and learning can benefit future projects as long as continuity of sequential development (and hence staff) can be preserved. For example learning obtained from foundation design and installation as well as transmission infrastructure will be highly relevant to future EA zone projects.
2. **Other offshore windfarms owned by SPR/Vattenfall:** Much of the supply chain development, good practice and learning can benefit the parent company future projects where confidentiality and synergies in project physical parameters allow.
3. **Offshore windfarms owned by others:** In terms of development of a sustainable, competitive supply chain, impact is probably greater than any other single project planned to be installed in UK waters before the end of 2020, due to its scale and site characteristics. Many of the benefits of good practice and learning are also applicable and will spread through dissemination via industry collaborations such as RenewableUK and OWPB.
4. **Wave and tidal projects owned by SPR/Vattenfall:** Both organisations have interests in these sectors, giving further opportunity for knock-on benefit. Some supply chain relationships and learning will benefit and much of the purchasing good practice is directly relevant.
5. **Wave and tidal projects owned by others:** Some benefits remain in specific areas. Benefits will be increased if Government applies some of its offshore wind supply chain measures to the sector.
6. **The wider low carbon generation sector:** Benefits beyond the marine renewables sector, in terms of increased confidence, sustainability and best practice. If supply chain plans and a focus on UK content is rolled out further, then the benefits of the EA1 Project will increase, especially in the East of England via the vibrant support sector in the region, for example EEEGR.

2.9.4 Where additional specific impacts are recognised, headlines are described in the sections below relating to each contracting element (2.10 to 2.20).

2.10 Contracting strategy

2.10.1 Key to understanding EA1's approach to competition (and also innovation and skills development) is to understand its contracting strategy, which is based on the following packages:

- Multiple small packages in the project development phase;
- Turbine Supply, Installation, Commissioning and 5 years operation;
- Foundation Design;
- Foundation Fabrication;
- Foundation Installation;
- Array Cable Supply;
- Array Cable Installation;
- Transmission EPCI;
- Ports and logistics; and eventually
- Out-of-warranty operation.

2.11 Project development

2.11.1 ***Importance of UK for parent organisations offshore businesses –*** Both SPR and Vattenfall have relocated their UK offshore teams to London to aid the development of the EA zone. Iberdrola, SPR's parent organisation, has also chosen to establish its worldwide offshore business in the UK. This focus on projects being delivered from the UK has created an environment where learning can be shared across European projects and has resulted in over 225 people being employed full time in the UK. Since 2010, the two businesses have also committed to a 10 year lease on their central London offices. This jobs growth and

building lease demonstrates SPR and Vattenfall's commitment to delivering projects from the UK, using Round 3 as a platform. However, it is also important to recognise the wider additional benefits to the UK economy of locating the development teams in the UK – including opening up opportunities to the local UK supplier community. [C3,C2,C5] {ii, iii}

2.11.2 ***High proportion of UK development expenditure –*** The EA1 Project has planning consent and is at an advanced stage of development. To date £94M has been committed to developing the entire EA Zone of which £64M has been committed on the EA1 Project. Much of the expenditure on the EA1 Project has been incurred on the delivery of environmental and technical site investigation studies. The largest order placed to date was incurred with, UK company, the Wood Group for the provision and installation of two met masts (£17M). The EA1 Project is now at the detailed engineering phase and has just contracted with Fugro Geo Consulting to complete a Geotechnical study (£13M) to enable further site definition and commence detailed engineering for certain key packages. [C1] {ii}

2.11.3 From EA1's in-house monitoring, it is estimated that over 95% of spend (in-house and external) has been with UK registered companies. [C1,C2] {ii}

2.11.4 ***Use of competition and promotion of local suppliers in development phase –*** Each of the major contracts placed during the development phase followed EA1's open and structured procurement process whereby EA1 has opened up the supply opportunity to as many credible bidders as possible. EA1 has particularly promoted supply from UK companies by inviting many to participate in EA1's tender processes and allocating some weighting towards UK content as part of EA1's tender evaluation procedure. [C1,C2,C4,C5] {ii}

2.12 Turbine supply & installation

2.12.1 ***No framework agreement restrictions***: EA1 does not have any framework agreements in place with any WTG supplier and has an open approach to considering alternative supplier solutions this promotes competition and innovation. Key learning from past experience on the parent companies' other offshore windfarms influenced the decision to combine the wind turbine supply and installation packages as a joint scope of works.[C1,C2,C3,C4,C5]

2.12.2 ***Open competitive tender process***: Twelve WTG suppliers were contacted during market engagement, seven (58%) of which were either new or less established offshore wind suppliers. The process progressed to include six suppliers in the formal tender process and now three supplier models remain in the shortlist which was determined in July 2014. [C1,C4,C5] {ii}

2.12.3 None of the three turbines has yet been installed in any quantity offshore, so EA1's use of any of these turbines will accelerate their journey to large-scale commercial use. This helps address the key turbine-related concern of the timing of this journey raised in *The Crown Estate's Offshore Wind: A 2013 supply chain health check*. [C1,C2,I2,I4] {ii, iii}

2.12.4 ***Turbine supplier supply chain plan commitments:*** Each shortlisted supplier has provided a supply chain plan (as described in 2.8) offering a broadening of their supply chain and each has entered an MOU with EA1 as evidence of their commitment to deliver on these plans (Annex 8) [redacted]. [C1,C2,C3,C4,C5,I1,I2,I3,I4,I5,I6,S1,S2,S3,S4,S5] {ii, iii}

In-warranty operation

2.12.5 As indicated in 2.3.3, the selected WTG supplier(s) will perform in warranty operations and servicing activities during the five year warranty period. EA1 will work closely with the WTG OEM during this period to develop the skills and knowledge required to either perform in house or sub contract these services to another third party following the expiry of this term. The impact of this strategy will be to create the conditions for competition development in the area of post warranty WTG maintenance which we expect will grow and lead to cost reduction in the longer term. [C1,C2,C3,C4,C5]{ii}

2.12.6 During the initial warranty period EA1 will engage with other offshore wind developers utilising or likely to utilise ports and harbours around the East Anglia area to explore the possibility of collaborating together to use these facilities and services with a view to generating synergies from this action. [C4,I3] {ii, iii}

2.12.7 ***Impact:*** The actions described above address all of the criteria relating to competition, as outlined in Annex 1. Generic impacts are discussed in Section 2.9. Key package-specific impacts at a project level are: [C1,C2,C3,C4,C5] {ii}

- New investment in one or more UK manufacturing facilities, by the turbine manufacturer or 3rd party supplier. This is dependent on suppliers chosen and also decisions taken on other projects.
- Provision of a further offshore turbine, foundation and other component or operation test site.
- Turbines not yet installed in commercial projects being used, independent of which supplier chosen.
- Further localisation of supply.

2.12.8 All of the above impacts have knock-on impacts at a wider level, including projects beyond the EA1 Project and in sectors beyond offshore wind, as discussed further in Annex 6. {iii}

Turbine installation

2.12.9 ***Installation wrapped following lessons learned:*** As part of the scope of works each WTG supplier was requested to provide a transport and installation offer. This request was influenced by the recent decision to combine these packages on SPR's Wikinger project with the developer advantages including a reduction in interfaces to manage and the allocation of this scope lying with the party best placed to manage the installation risk. This part of the WTG suppliers' scope is fully integrated with the WTG supply negotiations outlined above. [C3] {ii}

2.12.10 ***Open market of installation suppliers considered:*** The shortlisted WTG suppliers have included as part of their tender responses installation proposals including 13 vessels and multiple port choices. EA1 will work with the preferred WTG supplier to engage the pool of suitable vessel owners and port locations for the delivery of the project. [C1,C2,C4,C5] {ii}

2.12.11 ***Collaboration to share knowledge & facilities:*** EA1 will discuss turbine installation specific lessons learned from past offshore wind projects with the chosen supplier to ensure that the optimal execution plan for the EA1 Project is defined. EA1 is already having these discussions as part of the turbine package optimisation workstream (3.3.2). Further comments on shared port facilities are noted in 2.19. [C1,C2,C3,C4,I3] {ii, iii}

2.12.12 ***Impact:*** The collective impact of the above activities on the wind turbine installation sector will be to drive: [C1,C2,C3,C4,C5] {ii, iii}

- Competition in installation of very large turbines far from shore and in relatively deep water
- Good practice with regard to lessons learned and vertical communication
- Localisation of supply, where there are shared benefits to do so

2.13 Foundation Design

2.13.1 ***Previous jacket experience informing approach:*** Steel jacket foundations are the optimal solution for the project's water depth and soil conditions. This decision was influenced by Vattenfall's experience of jacket installation on the Ormonde Offshore Windfarm and SPR's recent experience contracting this foundation solution for its Wikinger project. In both such occasions new suppliers were introduced to this area of the market (as described in 2.2).[C1, C2, C3, C5] {ii, iii}

2.13.2 ***EA1 owns the design which gives greater supplier options***: EA1's approach has been to ensure that it has ownership of the design specification produced. This strategy allows EA1 to promote the fabrication opportunity to a wider number of potential suppliers than had an existing concept design tailored to the facilities of a smaller number of fabricators option been selected. [C1,C2,C4] {ii, iii}

2.13.3 ***Open and competitive tender process***: Thirty seven suppliers were initially contacted during market engagement the majority of which were new or less established suppliers in the offshore wind market. EA1 is close to awarding a contract to the preferred foundation design supplier. [C1,C4,C5] {ii}

2.13.4 EA1 will challenge the contracted supplier to optimise the jacket solution to be deployed on the EA1 Project ensuring that particular consideration is given towards the prospect of standardising and simplifying aspects of the design for fabrication. EA1 will also examine the concept of further integration of the WTG tower and foundation as this is considered to be an area which could generate future cost savings. [C3,I2,I5] {ii, iii}

2.13.5 ***Impact:*** It is expected that aspects of this design solution will also be of use to SPR and Vattenfall's future pipeline of offshore projects. Learnings from the EA1 Project should also result in foundation fabrication cost savings on the next EA Zone projects and SPR's St Brieuc project.[C3,I6] {iii}

2.14 Foundation Fabrication

2.14.1 ***Fabrication lessons learned:*** Vattenfall and SPR's experience in contracting and installing jacket foundations resulted in lessons learned including the need to promote close collaboration between the chosen foundation designer and the elected fabricator. Although the design of the foundation will have differences, this experience gives EA1 confidence to drive competition in this package. [C3, C5, I5] {ii}

2.14.2 ***Action taken to reduce barriers to entry***: EA1 recognises some of the barriers to entry in this market (including having sufficient financial strength and serial production facilities) and the challenges in fostering UK content in this area, that is why as part of its market engagement/PQQ activities EA1 has:

- Brought together certain suppliers to explore partnering opportunities to strengthen their market offering and support necessary investments. These actions are intended to deliver long-term supply capacity and cost of energy reduction. EA1's activity is evidenced by the 'Letters of Acknowledgement' EA1 has received from certain fabricators.
- EA1 has included organisations not normally associated with offshore jacket fabrication as part of its market engagement and PQQ process in an effort to highlight the opportunity and bring new entrants into the market [C1, C2, C4, C5] {ii, iii}

2.14.3 ***Broad market engagement and open tender process:*** EA1 made contact with 104 suppliers for this package, many with different industry backgrounds including oil & gas. Of the suppliers engaged 75 (72%) were either less established or new to offshore wind and included 12 new suppliers from the Far East. [C1, C2, C4, C5] {ii, iii}

2.14.4 Forty seven suppliers were subsequently issued a PQQ in June 2014, 21 (45%) of these suppliers are new to the offshore wind industry. Ten of these suppliers were contacted for pile fabrication only.[C1, C5] {ii, iii}

2.14.5 ***Initiatives underway to increase competition and optimise design***: As part of the PQQ process EA1 is exploring a number of initiatives to increase competition and UK benefit. which include: [C1, C2, C3, C4, C5, I3] {ii}

- Multiple suppliers of foundations (up to two fabricators), to enable use of smaller or newer players where the risk of using them for the whole project would be too great.
- Separation of supply of main foundation structures and pin piles scope. Up to two suppliers are being considered for pile supply only.
- Providing foundation suppliers an additional option to put forward their own design solutions if they consider this could improve the foundation and deliver cost reduction.
- Understanding the triggers to unlock investment in next-generation series manufacturing facilities using technology from other sectors as a key means for reducing cost.
- Provision of additional geophysical, geotechnical and metocean data if necessary to maximise quality of design, thereby reducing lifetime cost.
- Designs optimised in dialogue with a steel supplier and WTG supplier.
- Challenge and support to fully explore the cost of energy benefits of semi-standardisation of designs to facilitate lower cost manufacture and installation.

2.14.6 In line with EA1's strategy for each major package it has requested supply chain plans from certain suppliers involved in the tender process (as described in 2.8), provided in Annex 8. The highlights of each plan are described below. [redacted] [C1, C2, C3, C4, C5, I1, I1, I2, I3, I4, I5, I6, S1, S2, S3, S4, S5] {ii}

2.14.7 An order for the EA1 Project foundation fabrication would: [C1,C4,C5,I2,I5] {ii, iii}

2.14.8 ***Impact:*** The actions described above address all of the criteria relating to competition, as outlined in Annex 1. Key package-specific impacts at a project level are: [C1,C2,C3,C4,C5] {ii, iii}

- New investment in one or more UK manufacturing facilities, including via partnering, dependent on suppliers chosen and also decisions taken on other projects.
- Multiple suppliers enabling increased competition and opportunity for more suppliers to deliver.

- Significant opportunity for localisation of supply.

2.14.9 All of the above impacts have knock-on impacts at a wider level, including projects beyond the EA1 Project and in sectors beyond offshore wind, as discussed further in Annex 6. {iii}

2.15 Foundation Installation

2.15.1 ***Leadership installing jackets in scale:*** The EA1 Project will be one of the largest offshore wind project ever installed using jacket foundations and presents a significant learning opportunity for EA1, the parent companies and the installation contractor. EA1 is taking an open approach to the procurement of an installation contractor and is considering a variety of alternative vessels for this scope of works including the latest heavy lift floating vessels and next generation jack up vessels. [I4] {ii, iii}

2.15.2 ***Open and competitive tender process:*** Fifty seven potential suppliers were contacted during market engagement, 29 (51%) of which were new suppliers to the offshore wind market. The PQQ for this package was sent to 24 suppliers during June 2014. Following EA1's evaluation of these responses the formal tender process will be launched in Q4 2014 with the preferred supplier appointed in Q4 2015. [C1,C2,C4,C5] {ii}

2.15.3 ***Optimisation planning:*** As part of the tender process, EA1 will collaborate with its shortlisted installation suppliers to design the most efficient and effective logistics and execution options for the EA1 Project which utilise the preferred UK ports (see 2.19) [C3,I3] {ii, iii}

2.15.4 ***Impact:*** We expect that the experience gained by both the project and supplier installing the EA1 Project foundations will prove highly transferable and valuable for future jacket installation offshore. This is expected to lead to a reduction in installation costs for future offshore projects.[C3,I4, S4] {ii, iii}

2.16 Array Cable Supply

2.16.1 ***Innovative technology choice:*** EA1 intends to use latest technology 66 kV AC array cables, with associated 66kV protection and switchgear. [C1,I2] {ii, iii}

2.16.2 ***Lessons learned***: The project has discussed cable-specific lessons learned from other projects. Key learning from this included the interface management issues between cable supplier and installer, additionally; other consideration has been given to the adequacy of survey data which is provided to the chosen contractor. Later in the process, EA1 will share this learning with short-listed suppliers and seek their learning in return, to enable development of more vertically integrated approach to delivery which may also include shared use of EA1's preferred construction port. [C3,I3,I6] {ii}

2.16.3 ***Wide market engagement***: EA1 has contacted nine suppliers as part of its market engagement activities to determine the capability to supply 66kV array cable to EA1. Of this field 3 suppliers (33%) were either less established or new offshore wind suppliers including a supplier from Japan and one from China. The PQQ will be issued to potential suppliers during Q4 2014 with the formal tender commencing in late 2014/early 2015. [C1,C2,C4,C5] {ii, iii}

2.16.4 As part of EA1's tender process, particular attention is being given to Companies that have already made investments in the UK market

2.16.5 ***Impact:*** The key package-specific impact at a project level is new investment in UK manufacturing facilities, dependent also on decisions taken on other projects. This also impacts projects beyond EA1 and in sectors beyond offshore wind, as discussed further in Annex 6. {iii}

2.17 Array cable Installation and Protection

2.17.1 EA1 is currently considering combining the array cable supply package with the array cable installation package. This decision is being influenced by the lessons learned by EA1's parent companies on other offshore wind projects with specific consideration being given to the advantages of allocating delivery, installation and quality responsibility to a single party. [C3] {ii}

2.17.2 ***Approach designed to maximise competition***: Despite the advantages outlined above of combining this package, EA1 is deliberately presenting these packages to the market separately at this time. It is considered that this approach allows a greater number of potential installation suppliers to participate in the tender process than if only EPCI organisations had been engaged with from the start (managing both cable supply and installation scopes of work). Such parties often have their own narrower preferences in terms of

favoured installation partners and by adopting this strategy EA1 are promoting competition and providing a wider pool of suppliers access to this opportunity [C1,C2,C3] {ii, iii}

2.17.3 ***Wide market engagement***: Twenty six potential cable installation suppliers have been approached as part of the market engagement activity for this package. Of the 26 parties engaged, 17 (65%) are either less established or new suppliers to the offshore wind industry. The formal tender will be launched in 2015 with preferred supplier award taking place in Q1 2016. [C1,C4,C5] {ii}

2.17.4 To help ensure the most cost effective and efficient cable installation programme is derived EA1 will collaborate closely with the successful cable installation supplier to share the lessons learned on projects such as WoDS and will seek to provide additional geophysical, geotechnical and metocean data to ensure EA1 is well placed to design the most effective execution plan. [C3] {ii}

2.17.5 ***Impact:*** The EA1 Project will be one of the first offshore windfarms to deploy 66kV array cable. The experience gained on the EA1 Project will benefit future projects electing to use 66kV technology which represents a realisable cost reduction choice. [I2,I4] {ii, iii}

2.18 Offshore Transmission EPCI ("Grid Package")

2.18.1 ***HVDC technology being considered***: This package comprises the design, engineering, procurement, manufacturing, supply, delivery, construction, installation, testing and commissioning of all works associated with the Grid Transmission System. Comprising a single combined AC collector & HVDC Converter offshore substation platform and an onshore HVDC converter station with 320kv export cables connecting the converter platforms.

2.18.2 If HVDC is selected, the EA1 project will be the first UK offshore windfarm to deploy this technology, so any contracts will significantly further develop the supply base and drive competition relevant to the UK for offshore HVDC substations and remove a barrier for the whole industry. [C1,C2,C5,I2,I4,I3,I5] {ii,iii).

2.18.3 ***Lessons learned:*** Before commencing a pre-qualification exercise, EA1 considered lessons learned from previous substation procurement. EA1 has also sought lessons learned from the shortlisted suppliers who have been involved in some of the German HVDC projects to enable a more informed, efficient and integrated approach to the EA1 Project. Such learning includes the need to give thorough consideration to fabrication impacts during the detailed design stage in order to avoid costly re-engineering and variations at a later stage. Experience also indicates that maximising the amount of onshore commissioning improves overall efficiency and can accelerate delivery of the offshore installation phase. [C3] {ii]

2.18.4 ***Several new entrants considered:*** Seven suppliers were contacted through the market engagement process, four (57%) of which were either new or less established offshore wind suppliers. One of these suppliers is of Chinese origin. Four suppliers progressed to the formal tender process. [C5] {ii}

2.18.5 Although EA1 will contract a full EPCI package, a pre-qualification process was used to facilitate the exploration of a number of measures to increase competition and UK benefit. Including challenging the cost of energy benefits of semi-standardisation of electrical and mechanical interface to facilitate lower cost manufacture and improved spares position. [C1,C2,C4,C5,I2,I3,I5] {ii}

Sub-suppliers for HVDC transmission

2.18.6 Two potential suppliers have engaged with a significant local company that is capable of fabricating AC substations for the EA1 Project. If this supplier was awarded the contract over 200 direct jobs would be created over a two year period. This is further evidence of EA1 encouraging its tier 1 supply chain to maximise UK content and connect lower tier UK suppliers with a supply chain opportunity. EA1 has a supply chain plan from this potential sub supplier (Annex 8.11.2). [C1,C2,C3,C4,C5,I1,I2,I3,I4,I5,I6,S1,S2,S3,S4,S5] {ii, iii}

2.18.7 ***Impact:*** The actions described above address all of the criteria relating to competition, as outlined in Annex 1. Generic impacts are discussed in Section 2.9. Key package-specific impacts at a project level are:

- Investment in new manufacturing capability in electrical and mechanical areas.
- Tier 1 suppliers committing to increased localisation of supply.
- Addition of new jobs in a range of areas and securing existing jobs.
- Competition in a key new area of supply for UK projects – first UK HVDC project. {ii}

2.18.8 All of the above impacts have knock-on impacts at a wider level, including projects beyond EA1 and in sectors beyond offshore wind, as discussed further in Annex 6. {iii}

2.19 Ports and Logistics

2.19.1 ***Collaborative approach to utilise ports:*** EA1 has run a detailed process to establish preferred port locations for construction and operation. EA1 will share the information gathered with shortlisted WTG, Foundation & Cable installation suppliers to develop a cohesive strategy for shared use of these ports, where possible, recognising that suppliers for some packages have responsibility for final selection of logistics arrangements. This creative, joined up approach will help break down barriers to investment and generate synergies [C1,C2,C4,I3] {ii, iii}

2.19.2 ***Impact:*** The actions described above address many of the criteria relating to competition, as outlined in Annex 1. Generic impacts are discussed in Section 2.9. The key port-specific impact at a project level is increased efficiency of using land facilities, with the prospect of securing new investment, dependent also on decisions taken by others. This also impacts projects beyond EA1, as discussed further in Annex 6. {ii, iii}

2.20 Out-of-warranty operation

2.20.1 EA1 is preparing for post warranty operation now. This relates to care of turbines, foundations, array cables, transmission and other operational services, the most critical of which being ongoing operation, planned maintenance and unplanned service of the turbines. [C3] {ii}

2.20.2 Critical to driving competition in this area, is the availability of relevant service records, operational data and know-how. With this, it is possible to establish viable in-house and 3rd party solutions to compete with conventional approaches led by the turbine-manufacturer. EA1 is seeking to establish as much access to data and know-how as possible during the turbine contracting activities, Section 2.11.4. [C1,C2,I5] {ii, iii}

2.20.3 ***Impact:*** The actions described above could in time have a very significant impact on the industry, as it evolves lifetime care strategies in response to the joint challenges of cost of energy, quality and sustainability post warranty. This also impacts projects beyond EA1 and in sectors beyond offshore wind, as discussed further in Annex 6. [C1,C2,C3,C4,C5] {ii, iii}

3 Innovation

3.1 Overview

3.1.1 ***Innovation part of parent company ethos***: Iberdrola is committed to innovation and was ranked as the 4th leading European utility to invest in R&D activities in 2012[1]. Iberdrola will invest £372M (€450M[2]) during 2012-2014 in R&D in emerging and sustainable technologies. As detailed in the Iberdrola Innovation Report 2011-2013[3], Iberdrola's R&D efforts are focused on seeking to optimise operating conditions, improving safety, reducing environmental impact and developing technologies to face the energy challenges of the future. This positive attitude to innovation is also present in SPR and EA1.

3.1.2 ***Ambitious targets***: The EA Zone represents an opportunity to embrace innovation and deliver a cost effective project with acceptable levels of risk. With this in mind EA1 has set the following ambitious targets:

- Reduce the Levelised Cost of Energy (LCOE) to £100/MWh by 2020, in line with recommendations of the Offshore Wind Cost Reduction Task Force report[4]. Recognising that although EA1 will achieve FID before this point, its activities will influence cost reduction to benefit future EA Zone and wider offshore wind projects.
- Invest an average of £3.5M per year in R&D/innovation and investment in new technologies specifically for offshore wind
- Tier 1 supplier investment of an average of 3% of annual offshore wind revenues on developing better, more cost effective solutions for the future

We believe the second and third targets above will result in a total expenditure of £50M on R&D and innovation attributable to the project. [I1] {ii, iii}

3.1.3 LCOE is the dominant parameter assessed in measuring the value of innovative concepts and is the driving force behind much of EA1's activity in this area. [I5] {ii, iii}

3.1.4 EA1's R&D investment targets will help drive activity through the supply chain to achieve its LCOE goal through encouraging further innovation. EA1's potential tier 1 suppliers' commitment to innovation is already evident in the MOUs that have been entered and supply chain plans received (Annex 8)[redacted]. [I4] {ii, iii}.

3.1.5 The sections below set out the actions that are being taken or planned to address each of the key impact criteria (as set out in Annex 1) at an industry wide and package specific level for each key component of the windfarm. The impact on the supply chain and the wider impact across the low carbon electricity generation industry is also indicated where possible. Where available website references for innovation projects and initiatives are either included in the text or have been captured in Annex 2H.

3.2 R&D and Technological development [I1&I2]

Project development

3.2.1 ***Industry wide projects:***

- ***Grid integration:*** The TWENTIES project is a large EU collaborative R&D project to assist the integration of renewables onto the grid. This project, encompassing 26 European partners, involves 6 large scale demonstrations. Iberdrola is leading one of the demonstrations to prove that wind energy can collaborate technically in grid integration by way of new voltage and active power control systems at wind turbine, windfarm and control area levels. This Iberdrola-led demonstration has already delivered the final development of control tools. The final outcomes of this project will be hugely beneficial to onshore/offshore wind generators and grid operators across the industry. [I1,I2,I5] {iii}

[1] The 2013 EU Industrial R&D Investment Scoreboard
[2] Foreign exchange rate used in plan - €1.21:£1. Source: Iberdrola Market & Prospectives
[3] Iberdrola Innovation Report 2011-2013 (http:// www.iberdrola.es/webibd/gc/prod/en/doc/innovacion_informe13.pdf)
[4] Offshore Wind Cost Reduction Task Force report, June 2012 – target based on the EA phase that achieves FID in 2020

- ***Floating LiDAR validation:*** SPR is currently developing a Floating LiDAR demonstration project at EA1 where the aim is for 2 floating LiDAR technologies to be deployed and tested as part of the offshore wind industry's drive to make floating LiDAR technology bankable, reducing reliance on costly offshore met mast solutions. [I2,I5,I6] {ii,iii}
- ***Wake modelling:*** SPR is supporting the wakes measurement campaign at Rødsand 2. This project will provide future validation data to improve and validate wake models. [I5] {iii}
- ***Bird monitoring***: As a member of the Offshore Renewables Joint Industry Programme (ORJIP) industry-public collaboration focused on environmental monitoring, SPR is an active consortium member in the Bird Collision project which will monitor bird behaviour for 2 years at Thanet offshore windfarm to help understand this impact to inform more effective consenting submissions. [I5] {iii}
- ***Sea condition monitoring****:* EA1 has deployed two innovative instrumentation buoys in the EA1 zone to monitor sea conditions to inform its engineering activities and installation planning. Live data collected from the wave buoys is shared publicly via the CEFAS website (Annex 2J weblink). This information will assist any parties interested in the oceanographic conditions in the South West North Sea for example other offshore wind, wave and tidal generation developers, and weather forecasters. Sharing this information may allow others to save costs by reducing the need for similar devices to be deployed in this region. EA1 is also using information gathered to support a Southampton University project to further understand scour at offshore windfarms.[I2,I6]{iii}

3.2.2 ***Package specific action:***

- ***More front end studies***: During development, EA1 intentionally engaged early with suppliers and carried out more studies than typical of the past, in order to enable better characterisation of and design for conditions. This approach enabled more informed decision making. EA1 is using this learning to inform the strategy to develop the next EA Zone projects. [I6] {ii}
- ***Pioneering aerial survey***: The EA1 Project is the first offshore windfarm to support the use of aerial digital imagery for offshore ornithological and marine mammal surveys. This innovation provided a more robust evidence base for assessments whilst reducing health and safety risks by minimising the risk to personnel working offshore. This survey methodology is now standard practice in the UK and these companies are now considered world leaders with the approach recently implemented in Germany, France and the USA. [I5] {iii}
- ***Bird monitoring***: EA1 is one of 12 developers, along with DECC, Marine Scotland and The Crown Estate, to contribute to a £2M project to deploy remote monitoring devices at an operational windfarm to investigate bird behaviour. This two year comprehensive study supports the deployment of innovative technology to address a key knowledge gap and is supported by UK Statutory authorities. [I5] {iii}
- ***Disturbance Effects on the Harbour Porpoise Population in the North Sea*** **(DEPONS)**: This project is an innovative study with the aim of understanding the consequence of disturbance from offshore wind related activities on harbour porpoises. EA1 is part funding this multinational collaborative study (managed by Aarhus University) to address a key knowledge gap which should help inform more effective consenting submissions. [I5] {iii}

WTG supply & installation

3.2.3 ***Industry wide action:***

- ***WTG Test sites:*** As noted in paragraph [2.3.2], SPR and Vattenfall already show leadership in the area of fostering the development of next generation wind turbines and foundations etc. via SPR's Baltic Sea, Wikinger Sud and Vattenfall's EOWDC proposed test sites , EA1 also intends to use a number of positions in the EA1 Project for demonstrating innovative new WTGs and foundation solutions, the first far from shore offshore wind demonstration site for the UK relevant to future projects. EA1 has discussed this with the Crown Estate [C1,I4,I5,I6] {ii, iii}
- ***Offshore Wind Drivetrain Innovation (OWDin)*** – SPR is a lead partner in this project to test multi-life bearings for offshore wind gearboxes with potential to improve offshore wind reliability and reduce operating costs. As part of this initiative an innovative wind turbine bearing management system for gearbox bearings will be deployed at SPR's Barnesmore windfarm [I1,I2,I5] {ii, iii}
- ***ORE Catapult SPARTA*** - SPR and Vattenfall are part of a group of 8 developers involved in the SPARTA project being managed by The Crown Estate and ORE Catapult. This project involves developer

collaboration by sharing operational windfarm data to support improvements in the availability, reliability and performance of offshore wind assets. SPR and Vattenfall are active contributors to the project and SPR will be sharing operational data from its WoDS windfarm (once fully operational later) in 2014. The impact of this project will be greater sharing of knowledge across the industry to improve offshore asset management and reduce the cost of energy. [I2,I6,S5] {ii,iii}

3.2.4 ***Package specific action:***

- ***First significant deployment of the latest state of the art WTGs:*** Each of the turbines shortlisted by EA1 has not been deployed offshore yet and each incorporates significant levels of technical innovation and should reduce LCOE (compared to lower rated WTGs) by between 10% - 15%. Examples of innovation are summarised in Annex 2.[redacted] [I1,I2,I3,I4] {ii, iii}
- ***Nacelle mounted LiDAR***: A notable innovation by the shortlisted WTG suppliers is the prospect of trialling nacelle mounted LiDARs to provide a more accurate measurement of the wind speed in front of the rotor which can be linked with the WTG controller to potentially reduce fatigue thrust loads which could result in a reduction in foundation costs.[I2] {ii, iii}

Foundation design, fabrication & installation

3.2.5 ***Industry wide actions***

- ***Monopile chalk deployment research***: SPR is the lead project partner in establishing a collaboration with Imperial College London and Geotechnical Consulting Group to develop new design procedures for the use of monopiles and jackets in chalk and has been successfully awarded grant support from the Technology Strategy Board's (TSB) "Infrastructure for Offshore Renewables" call. Such new design standards will be particularly beneficial for future offshore wind development in Northern Europe where chalk is a common ground condition. [I2] {ii, iii}
- ***Suction bucket foundation***: SPR is supporting the first full scale demonstration of a suction bucket jacket foundation to be installed in 2014. This foundation offers a potential cost saving alternative to jacket pile installation solutions and could be employed in future EA Zone projects. [I4] {ii, iii}
- ***Pile soil analysis project:*** SPR is playing a leading role in a Pile Soil Analysis project through its connection with the OWA with the aim of improving design standards for XL monopiles to enable this solution to be used in deeper water with larger turbines which has significant cost reduction potential. This project also offers the potential to improve jacket design standards. [I4,I6] {ii, iii}

3.2.6 ***Package specific actions***

EA1 will foster innovation in the foundations package via the following: [I2,I4,I5,I6] {ii, iii}

- Placing one of the largest ever orders for jacket foundations in the market with up to two suppliers, this will help support the investment plans of certain fabricators to increase capacity and purchase state of the art tooling equipment
- Collaborating closely with the chosen fabricator(s) to investigate how the design can be optimised for fabrication & steel weight
- Working with suppliers to introduce volume manufacturing techniques and methods to reduce production times, manufacturing efficiency, quality and reduce LCOE.
- Using lessons learned from the Ormonde project to inform EA1's approach to design standards and promote a serial production ethos to fabrication
- Maximising the opportunity within the tier 2 and 3 supply chain to standardise their offering for primary and secondary steel material (pipes & tubes)
- Challenging its installation provider to optimise the installation plan using the latest vessels and installation techniques

Array cable EPCI

3.2.7 ***Industry wide actions***

- ***OWA Cable Technical Working Group***: SPR and Vattenfall are part of this work group focused on array cable innovation. This project aims to qualify a number of 66kV cables so they are commercially available by the end of 2015 which will be beneficial to projects such as EA1 amongst others [I1, I2] {ii, iii}

- ***ORE Catapult*** - SPR sits on ORE Catapult's Industry Advisory Group providing direct input into its strategic direction and projects. SPR is an active contributor to ORE Catapult on projects in relation to the standardised testing of 66kV cables, fabrication techniques for new innovative foundation designs and exploring blade fatigue in relation to the offshore environment. All of these activities have the potential to reduce the cost of offshore wind. [I1,I2,I4] {ii, iii}
- ***OWA Dynamic cable project*** – SPR is an active contributor to an OWA project to examine how a typical static cable reacts to application in dynamic conditions (when subjected to wave and tidal motion). Dynamic cable applications include free hanging cables from existing foundation technology, which has the potential to reduce installation costs, or can be used to connect floating WTG or wave and tidal generation devices. The project will allow the industry to obtain greater awareness of cable performance to optimise the technical specification for cables being purchased in the future (and avoid costly over engineering). This is especially relevant to aid the development of less mature generation technologies such as wave & tidal and floating WTGs. Floating WTG in particular have significant potential to reduce costs and make deeper water offshore wind projects viable.[I2,I4,I5,I6] {ii, iii}

*3.2.8 **Project specific actions***

- ***First to adopt new 66kV technology***: EA1 is leading the offshore wind market with its choice of 66kV inter-array cable. This solution gives cost of energy advantages (compared to 33kV cables) particularly in reduced transmission infrastructure costs and reduced electrical losses. [I2] {ii, iii}
- ***Increased early engagement***: For both export and array cables, EA1 is being proactive to examine the specification of cables to better define its requirements to aid design of a lower cost but higher integrity solution. EA1 is encouraging suppliers to develop and produce cables in the UK to create jobs and economic benefit.

Grid Transmission System EPCI

*3.2.9 **Industry wide actions***

- ***Potentially the first ever HVDC export platform in the UK sector:*** The EA1 Project may be the first UK offshore wind project to use an HVDC connection which is currently its preferred transmission option. As the first of many, this is ground breaking and will encourage competition and innovation in the supply chain to meet the demands of this new solution. Based on SPRs involvement with the OWPB, EA1 estimates that moving to an HVDC transmission platform and higher voltage array cables could reduce LCOE by 6%. [I2] {ii, iii}
- ***Meshed transmission networks R&D:*** SPR is currently sponsoring a PhD student at the University of Strathclyde's Doctorate Training Centre for Wind Energy Systems to investigate the important issue of meshed international transmission networks of relevance to the EA1 Project. EA1 will continue to explore annually with the centre areas in which academic students can continue to support the development of the EA1 Project. [I1,I2] {ii}
- ***HVDC offshore platform joint industry academic cost reduction study***: SPR is part of an industry-led collaboration with Babcock, Iberdrola Engineering and Construction (IEC) and the University of Strathclyde, to identify and validate ways in which significant cost savings can be made for HVDC offshore platforms. This project has been successfully awarded grant funding from the TSB's "Infrastructure for Offshore Renewables" call and will provide direct benefits to the EA1 Project given the significant electrical infrastructure required. [I2] {ii, iii}
- ***The BEST PATHS project*** (Beyond State of-the-art Technologies for Re-powering AC corridors and Multi-terminal HVDC systems). Iberdrola is a work package lead for an HVDC emulator proposed to be built in Trondheim, Norway as part of a £7.2M (€8.7M) sub project within BEST PATHS. This project will enable an increase of wind energy integration in offshore HVDC links, a key issue for the EA1 Project and future far from shore offshore windfarms. [I2,I5]{iii}
- ***Power Networks Demonstration Centre (PNDC):*** SPR has been working with ScottishPower as part of its role in the PNDC venture to build a medium voltage demonstration centre to support second tier suppliers, OEM's and emerging technologies to test and evaluate systems in a full scale test environment, and also demonstrate high voltage and power systems at part scale. It is believed MVDC technology offers benefits to both offshore wind generators and grid operators alike. [I1, I2] {ii, iii}

- ***Network Innovation Allowance (NIA):*** SPR is actively working with SPEN to support the development of NIA projects that impact on offshore transmission infrastructure, including a project looking at Low Frequency AC (LFAC) for offshore connections. LFAC has a potential to reduce the cost of offshore transmission technology for projects beyond 150km from the onshore connection point by around 30-50%, as well as offering an alternative to HVDC bootstraps in the onshore transmission network. SPEN will demonstrate LFAC in 2015 which should advance commercialisation of this technology. [I5] {iii}
- ***ORE Catapult – EA1 case study:*** Due to the limited deployment of HVDC solutions for offshore wind, further refinement can be done to optimise the architecture and key parameters of the transmission system. ORE Catapult is seeking to explore this area and EA1 is keen to use the EA1 Project as an example case. Even if (due to timing and commercial reasons), the EA1 Project is not in a position to fully adopt the results, EA1 recognises the value of such an activity to future EA Zone projects and the wider industry, as it explores ways to reduce cost of transmission, especially for far from shore projects. [I1,I2,I4] {ii, iii}
- ***Marin-El project –*** Iberdrola's Engineering and Construction division is designing a new self-installing offshore substation concept with a view to accelerating installation and significantly reducing the costs of offshore wind projects. This is a £8.3M (€10M) project, supported by the Basque Government and is highly relevant to future EA zone and other offshore wind projects. [I2,I4] {ii,iii}

3.2.10 ***Package specific action***

- ***EA1 project team activity*****:** EA1 is actively looking at improvements in transmission technologies to reduce the future costs of offshore wind, including: [I2] {iii}
    - Improved classic 50Hz AC systems
    - Optimised DC solutions, simplifying the technology and reducing the offshore footprint.
    - Actively investigating alternative technologies such as low frequency alternating current to improve offshore transmission costs.
    - Engaging with a wide range of suppliers and emerging suppliers to understand the development of transmission technologies from 2020 to 2030.

3.2.11 ***Shortlisted supplier innovation:*** The HVDC substation option offers significant opportunity for innovation, both in the design but also in installation. The shortlisted suppliers each have significant R&D programmes running and, following award, there will be a process to manage a range of innovations to incorporate into the solution for the EA1 Project.

- ***Grid optimisation:*** EA1 is considering sizing the transmission system to be more reflective of actual usage, as discussed in The Crown Estate's Offshore Wind: Cost Reduction Pathways Study. This is because the full rating of the transmission system is rarely fully used, due to the lack of correlation between sufficient wind speeds for maximum generation and the availability of all turbines to generate at this time. This could be a more cost effective alternative to a full rated system. [I2] {ii, iii}

3.3 Innovative procurement or contracting practices [I3]

3.3.1 ***Tier 1 supplier commitment to competition, innovation, skills & UK benefit***: A key requirement of EA1's tender process is the request for suppliers to prepare supply chain plans as noted at 2.8.1 which specifically address their approach and future actions to further innovation in the industry. This is a new and innovative means to promote competition, innovation, skills and UK content and drive these commitments through the various supply chain tiers. Following supplier award EA1 will dedicate resource to ensure that the innovation commitments made by its suppliers are delivered and will be tracked at appropriate milestones. [I3] {ii, iii}

3.3.2 ***WTG Optimisation work stream***: EA1 has challenged its shortlisted WTG suppliers through a dedicated optimisation work stream to demonstrate how further innovation can be implemented through their WTG supply and installation offers. This work has been structured by examining the following six key areas with each supplier: [I1,I2,I3,I6] {ii}

- Optimal windfarm layout
- Wind turbine upgrade opportunities
- Optimised O&M approach
- Early revenue delivery

- Foundation design improvement
- Optimised Installation & logistics execution plan

The selection of each of these areas has been informed by the learning of the EA1 project team from past project experience and these insights have been compared and shared with those of the supplier in the course of several collaborative workshops held already on the optimisation topic. The outputs of this work stream to date include a number of new innovative concepts that have been identified which may have significant benefit to the EA1 Project and aid future industry cost reduction. [I2,I4,I5,I6] {ii, iii}

3.3.3 To help deliver future LCOE reduction, EA1 will also consider how to incentivise the chosen WTG supplier following award to deliver further LCOE benefits and include this in the final supply contract. [I5] {ii}

3.4 Innovative or new installation methods [I4]

3.4.1 ***Deep water mast deployment:*** The met mast designed for the EA1 Project includes a number of innovative features including (i) the foundation, which at over 40m water depth, is one of the deepest water monopiles installed in the renewables industry to date, and (ii) the conical design employed which reduced weight and saved costs. This learning will also benefit future projects including those in the EA Zone. [I2,I6] {ii, iii}

3.4.2 ***HVDC substation installation:*** A significant innovation opportunity is in the installation of the HVDC converter platform which could weigh in the region of 10,000 tonnes and has very limited options in terms of installation vessels to perform the installation operation. EA1 intends to explore an innovative self-installing system, where the substation is floating and pulled to site by tug, before jacking it into position. Should EA1 adopt and manage to deliver this approach successfully, then it could be adopted also on HVAC substations for deployment on future offshore wind projects. [I1,I2,I4,I5] {ii, iii}

3.4.3 ***State of the art installation vessels deployed:*** EA1 will make use of state of the art offshore installation vessels for the WTG, foundation and cable installation packages. The award of an EA1 Project order also has the potential to support new vessel orders to add capacity to the market. [I1,I4]{ii}

3.5 Wider innovation in offshore wind [I5]

3.5.1 Further details around the leading industry groups SPR are involved in include:

3.5.2 **OWA** – Managed by the Carbon Trust, the aim of the OWA programme is to reduce the costs of offshore wind by 10%. SPR has representation on the OWA Steering Committee and has representatives within the technical working groups which focus on each of the issues below:

- Turbine foundation designs for 30-60m water depths
- Access systems to transfer technicians and equipment onto turbines
- Improving cable installation methods
- Electrical and transmission systems, primarily HVDC
- Improving the layout of large windfarms to reduce wake effects
- O&M and condition monitoring.

The OWA's focus is on reducing the cost of the UK's Round 3 sites, SPR is actively participating in this successful innovation programme in order to deliver cost reduction and bring innovative new technologies and processes to the EA1 Project and the wider industry. [I1,I2,I3,I4,I5,I6] {ii, iii}

3.5.3 **The University of Strathclyde's Low Carbon and Energy Technology Innovation Centre (TIC)** – SPR is a founding member of the TIC alongside SPEN, SSE and Technip. This industry/academic collaboration takes forward industry-led research projects in the areas of electrical networks, onshore/offshore wind asset maintenance and offshore foundations with a focus on development and innovation. EA1's efforts are focused on seeking solutions to technical problems to optimise operating conditions, improving accessibility/operability whilst reducing the LCOE of offshore wind. [I1,I2,I4,I6] {ii, iii}

3.5.4 **Offshore Renewables Institute (ORI)** – recently established by the Universities of Dundee, Aberdeen and Robert Gordon, the ORI is pooling their academic skills and facilities to support the development of offshore renewables in the UK. SPR is playing an important role in helping shape the ORI's offering to the offshore industry in the UK to ensure it complements existing innovation activity underway. [I5] {iii}

3.6 Sharing of best practice or lessons learned [I6]

3.6.1 ***Presence on leading innovation groups***: Certain initiatives (in particular the OWA, ORE Catapult, ORJIP and TIC listed above provide an excellent platform to engage with other developers and suppliers to share lessons learned and best practice to aid delivery of the LCOE reduction goals being undertaken by each group. Additionally, SPR and Vattenfall's role in the SPARTA project is a strong example of efforts already underway to share knowledge with other developers.(3.2.3) [I6] {ii, iii}

3.6.2 ***Learning transfer on key construction packages***: As set out in section 2, SPR and Vattenfall are actively sharing learning from past experience with the EA1 project team and supplier community partly evidenced by the work underway through the turbine optimisation workstream, foundation design refinement and scrutiny of historic issues on substation procurement and installation. [I6] {ii}

3.7 Impact

3.7.1 The actions described above address all of the criteria relating to innovation, as outlined in Annex 1. EA1 is using opportunities provided by such a large project, at 600MW and far from shore, in relatively deep water, with higher voltage array cables and HVDC connection to implement actions that either would not be possible or would be less impactful on a smaller or more standard project.

3.7.2 ***The key impacts of the EA1 Project are: {ii, iii}***

- Strategic focus and financial commitment to innovation of up to £50M directly attributable to the EA1 Project through outcome target setting and increased R&D budgets from us and key chosen suppliers.
- Rapid acceleration of collaborative HVDC technology development advances in the next generation of WTGs, foundation manufacture and installation, HVDC infrastructure and far-from shore operations, including associated verification and testing. Each with the potential to reduce LCOE.
- Facilitate the use of innovative supply chain practices and sharing of best practice and lessons learned, these being an integral part of EA1's procurement processes described in Section 2 and discussed further in relation to each package in Sections 2.11 to 2.19.

3.7.3 As offshore wind is such a significant element of the future low carbon electricity generating industry due to its scale, complexity and high requirements, the impacts described above are likely to significantly impact the wider industry as a whole, where synergies exist, for example: [C1,I1,I2,I3,I4] {ii, iii}

- Similar development of especially windfarm design, turbine control, jacket foundation manufacturing and 66kV array cable technology relevant to the EA1 Project. {ii, iii}
- Provision of a further offshore test site, dependent on any further external approvals required. This can be used to test a range of windfarm components, including turbines and foundations. {iii}
- Continued strong representation in national and international collaborative R&D activities, shaping the agenda, empowering delivery through sharing real challenges and pulling technology through to commercial use. {ii, iii}

EA1 has considered the impact of the EA1 Project on the wider industry in detail for six different types of project (see Annex 6), where the impact of 10 specific groups of actions are considered. Very strong benefit will be realised to other EA Zone windfarms and other offshore windfarms owned by SPR/Vattenfall. The same applies in some areas (including HVDC) to offshore windfarms owned by others. The key follow on benefit to the wider low carbon generation sector is recognised again to be in HVDC technology for mass energy transmission.

4 Skills

4.1 Overview

4.1.1 ***Target: EA1's target is to ensure a fully skilled workforce and appropriately trained workforce of between 1,500 – 3,000 people is available to deliver the EA1 Project safely and efficiently***. EA1 is determined to do this by preparing the local work force in East Anglia with the necessary skills required in order to leave a legacy of highly skilled and experienced people to support the delivery of the next eleven offshore wind projects in the EA Zone and benefit the wider low carbon generation industry. [S4] {ii, iii}

4.1.2 ***Consent commitment to invest in skills***: During the Public Examination of the EA1 consent application, EA1 set out its intent to invest in skills and deliver a skills strategy. [S3]

4.1.3 As part of this examination process a Skills Letter of Intent was issued by EA1 in July 2013. During examination a requirement was added to the final EA1 Development Consent Order for a skills strategy to be submitted and approved by local authorities and Suffolk County Council. In response to this EA1 has developed an Outline Skills Strategy (Annex 9). This outline strategy will be developed into a final skills strategy during 2015 and early 2016. The principles of the strategy will be delivered through a Skills Implementation Plan which will come into effect in 2016. The main principles of the outline strategy are: [S1,S2,S3,S4,S5] {ii,iii}

- To ensure the necessary balance of demand for, and supply of, professional and vocational skills to support the delivery of the EA1 Project and to leave a legacy;
- To promote employment and re-skilling opportunities in the communities most closely associated with the development of the EA1 Project;
- To utilise existing parent company skills programmes where and when possible and appropriate; and
- To make best use of existing local and national education and skills infrastructures and add value to these where appropriate.

4.2 Assessment of the future skills required [S1]

4.2.1 ***EA1 will generate significant employment & Gross Value Added (GVA)***: An assessment of skills was included in the Environmental Statement prepared for consenting purposes in 2012 which included a chapter on the socio-economic impact of EA1. As part of this submission, an employment demand forecast was prepared which indicated the following FTE requirements at each stage of the project (including direct, indirect and induced roles). This analysis was initially performed for a project of up to 1200MW in size. Using this methodology the number of jobs projected for a project of 600MW project would equate to:

- **Construction** 577 – 1,391 FTEs per year for 3 years
- **Operations** 58 -84 FTEs per year for 25 years
- **Decommissioning** 100 FTEs per year for 2 years

4.2.2 Using this methodology the net additional jobs would represent between £27M and £52M GVA per annum at a regional level, between £9M and £35M for net additional jobs elsewhere in the UK, and in total between £36M and £87M. Further detail around the types of role required at each stage are included in Annex 5. [S1,S2]

4.2.3 EA1 considers that the construction projections shown above, which were calculated in 2012, are likely to be exceeded based on more recent information obtained from the supply chain which indicates peak employment of around 3,000 FTEs during construction (Annex 2F). EA1 has considered this information in setting its ambitious jobs target above (4.1.1). [S1,S2]

4.2.4 In addition to the job estimates above, the EA1 project team currently includes 80 FTEs employed to complete the development phase of the project.

4.3 Assessment of the gaps between now and the future requirements [S2]

4.3.1 During the early development of the EA Zone, EA1 assessed the general skills requirements for the project. The assessment concluded that more detailed skills analysis for the construction, execution and operational phase of the project would need to be carried out but EA1 had the necessary experience and resource in place to complete the development phase. The assessment also indicated that the occupational profile of

East Anglia and the East of England offers great potential to provide a mix of skills relevant to the project due to the legacy of experience from oil & gas exploration in the Southern North Sea. [S2,S3]

4.3.2 EA1 is currently updating its assessment of skills demand and supply to inform its Skills Implementation Plan. This work is being informed by engagement with the supply chain, local enterprise, commerce and skills bodies. Although this work is incomplete, the early conclusions are: [S1,S2,S3,S4] {ii, iii}

- In-house project team demand should be met by the deployment of other parent company personnel into the EA1 Project team. The expected chronology of SPR's offshore wind pipeline is favourable to allow the transfer of relevant staff from its other offshore projects to transition and bring their skills to the EA1 Project at the right time. This approach also enables an effective means to transfer knowledge and experience.
- Collaboration with the supply chain, local educational institutions, adult retraining and national/local support bodies should continue to identify and address skills gaps.
- Further skills development is likely to be necessary in the following areas:
  - National Vocational Qualification (NVQ) Level 2 & 3 offshore wind service and maintenance skills
  - Engineering (all disciplines)
  - Project Management
  - Support disciplines (Health & Safety, Quality Assurance, Risk Management, etc.)

4.3.3 EA1 is being proactive in addressing these potential constraints through the actions and initiatives it, its parent companies and suppliers are involved in as described below.

4.4 Skills Initiatives Underway & Completed [S3]

4.4.1 ***EA1s parents are significant UK employers and are active in developing skills across the energy industry***: EA1's parent companies employ over 30,000 people. In the UK, ScottishPower employs over 7,000 people across the energy sector.

4.4.2 The parent companies play a leading role in the following initiatives to address the need for adequate skills in the offshore wind and wider energy industry: [S2,S3,S4,S5] {ii, iii}

4.4.3 ***Engineering targeted skills*** ScottishPower has invested significantly to address the engineering skills gap in the energy industry by implementing a number of programmes. Headline schemes include: STEM (Science, Technology, Engineering & Maths) events, online sector programmes and media, engineering and apprenticeship programmes. Further details can be found in Annex 2G. [S3] {ii, iii}

4.4.4 ***Graduate Recruitment Programmes -*** Both parent companies offer extensive graduate recruitment programmes. ScottishPower runs a graduate programme, with a yearly intake of 32 and an apprenticeship scheme with a yearly intake of 48, with 10% of the graduate intake working for SPR. This is complemented by a staff development programme open to all. [S3] {ii, iii}

4.4.5 ***Engineering Foundation Programme –*** Sponsoring engineering focused events via the ScottishPower Engineering Foundation Programme to provide students with a route into an apprenticeship as well as funding postgraduate scholarships relevant to the energy sector. [S3] {ii, iii}

4.4.6 ***Adult Retraining -*** ScottishPower has worked with the military resettlement organisation Career Transition Partnership to provide taster days to ex service personnel and EA1, through its Board representation on the EEEGR, is supporting industry awareness events for military personnel thinking about pursuing a career in the power industry via it's 'military in the Energy Industry' initiative which supports transition training for those wishing to move into the energy sector. [S3] {ii, iii}

4.4.7 ***Transferring Skills -*** Transferring skills from the parties' wider portfolio of thermal generation, offshore & onshore windfarms to projects such as the EA1 Project. This is evident by the workshops held between onshore wind & generation asset managers to share best practice to inform the training needs of EA1 O&M personnel. [S3] {ii, iii}

4.4.8 ***Renewables Training Network Group (RTN)*** - RTN is an independent group established to address an expected shortage of skilled workers in the renewable energy sector. RTN aims to deliver training to 12,000 new entrants by 2016 and develop the skills of 11,450 employees currently working in the renewables industry. SPR is an active advisor of RTN and helps influence the targeting of specific training initiatives to ensure this meets the needs of industry. [S2,S3,S4] {ii, iii}

4.4.9 **Skills & Employment Strategy Group -** ScottishPower is an active member of the Renewable UK's Skills and Employment Strategy Group whose mission is to ensure that a pool of skilled and experienced recruits for the wind, wave and tidal industries will be available to meet the sectors' current and future employment needs. ScottishPower has liaised with Professional Institutions such as the Institute of Mechanical Engineers and Higher Education representatives from Universities including Strathclyde and Goldsmiths as part of a working group to forge closer industrial links with these bodies and the Renewables Industry. [S5] {ii, iii}

4.4.10 **Renewable UK Skills Manifesto** – ScottishPower put forward a number of recommendations to Government for the wider benefit of the industry to drive forward the skills Agenda as part of this industry leading paper. [S5] {ii, iii}

4.4.11 **Offshore Wind Programme Board – Skills Workstream -** SPR is an active contributor to this workgroup which has been set up to focus on industry skill requirements needed for Round 3 offshore projects. [S5] {ii, iii}

4.4.12 **Norstec Network** – ScottishPower and Vattenfall are members of the Norstec network which brings together key players in the offshore renewables sector. As part of its commitment to public engagement, Norstec has launched a new skills pilot – The Norstec Academy, focused on engaging and informing the next generation of offshore wind employees and creating a community of positive advocates and future champions. ScottishPower, Vattenfall and EA1 have all offered to host students. [S3,S5] {ii, iii}

4.4.13 ***Local schools & universities:*** EA1 has working relationships with University Campus Suffolk (UCS), University of East Anglia (UEA), Norfolk University Technical College (UTC), Lowestoft College, Great Yarmouth College, Norwich City College and Colchester Institute the East of England Energy Group (EEEGR) and its core Skills for Energy Programme. Further details regarding the purpose of these various bodies are set out in Annex 2E. [S3,S4] {ii, iii}

4.4.14 ***Crown Estate collaboration:*** Working with The Crown Estate, EA1 has also carried out a Schools and Colleges Engagement Programme raising awareness in Norfolk, Suffolk and Essex of the employment opportunities in offshore wind. East Point Academy; Pakefield High, Benjamin Britten and Denes High in Lowestoft; Chantry in Ipswich; and, Felixstowe Academy have all been visited. [S3] {ii, iii}

Supply Chain Initiatives

4.4.15 EA1's supply chain is being encouraged to address skills requirements via its request for supply chain plans (2.8.1) which provide evidence of the steps suppliers are taking to invest in skills and training. From the plans received to date, suppliers intentions include Skills academies, Apprenticeships, Delegations workshops, Internships, Work Experience, Graduate Schemes, Collaborative Skills Development Initiatives, Skill Retention and Retraining Initiatives, National & local Training Schemes participation. [S1,S2,S3,S4,S5] {ii, iii}

4.4.16 More specifically:

- For HVDC technology EA1's shortlisted suppliers are supporting STEM initiatives. Two companies as major engineering employers and apprenticeship providers are engaged in leading industry bodies and academic initiatives to address any future supply chain gaps. There is a particular opportunity to develop HVDC skills to benefit future EA and other far from shore offshore windfarms. [S2,S3,S4] {ii, iii}
- For installation activities, installing 66kV array cables, up to 85 jacket foundations and up to 8MW WTGs in 40-50m water depth little is demonstrated so far. EA1 has had initial discussions with UK based companies about the different skills requirements due to these conditions. Both companies are involved with skills initiatives, offer apprenticeships and would work with EA1 if successful to identify gaps and address with adequate skills and training. The installation activities will result in valuable transferable skills being created to deliver future offshore windfarms. [S1,S2,S3,S4] {ii, iii}

4.4.17 Additionally a number of the suppliers have cited apprenticeship and NVQ training schemes that are already in place and will be continued based on the opportunity that the EA1 Project and other Round 3 projects offer. [S3,S4] {ii, iii}

4.5 Skills Initiatives to be implemented [S4]

4.5.1 EA1 will work closely with its chosen suppliers, academic and enterprise bodies to ensure that adequate resource is planned and delivered to the project during the construction and the operations and maintenance phases of the project. [S4] {ii, iii}

4.5.2 *Key to this will be the Skills Implementation Plan which will come into effect during 2016. Although not complete this plan includes the following proposals which EA1 would commit to: [S3,S4] {ii, iii}*

4.5.3 **Primary school level** - Aged 8-11: The development of new online focused activities and engagements that support a curriculum focus on STEM subjects. This work is designed to build on the EA1 sponsorship with Archant Newspapers of the 'Maths challenge' in Suffolk.

4.5.4 **Secondary school level** - Aged 11-16: The development of a generic learning offer themed around the EA1 Project to be made freely available online and a complementary focused approach working with selected schools.

4.5.5 **Post 16 Apprenticeships** – EA1 will work to encourage and support the growth of engineering and apprenticeships which are focused specifically on the requirements of the offshore wind industry. Such apprenticeship provision includes the Advanced level Wind Turbine Installation and Commissioning and the Advanced level Wind Turbine Operations and Maintenance. EA1 will commission delivery of relevant apprenticeship programmes from one or a small number of Further Education Colleges or Private Training Providers following a tendering programme. Whilst no employment guarantee would be made to individual apprentices, a 'job pledge' may be offered by EA1 and its supply chain.

4.5.6 **Undergraduate and post-graduate** – EA1 will build on its relationship with local higher education bodies including the UEA, UCS (and its network of partner Colleges) and the University of Essex to promote focused and collaborative engineering curriculum development in the future. This might include, undergraduate training opportunities for those successfully completing the level 3 Advanced level apprenticeship in the Power Industry.

4.5.7 EA1 will also look to build on the link between ScottishPower, SPR and Strathclyde University to assess where value from the current arrangements could be delivered in East Anglia. This might include: sponsored access to the Strathclyde Energy MBA, a 'year in industry' programme and internship opportunities. Additionally, EA1 will also consider how to connect the local graduate population with opportunities to engage with the Iberdrola Fundacion Scholarship and the Vattenfall International Trainee Programme.

4.5.8 **Adult retraining and reskilling** – Continued collaboration with the EEEGR to support the adult retraining initiatives underway as outlined in 4.4.6.

Supply Chain Initiatives

4.5.9 A 5 year plan for training and skills will be requested from EA1's suppliers as part of the tendering process. This will be reviewed along with EA1's own plans every 3 months at Project Board level with appropriate recommendations and actions taken to safeguard and deliver project skills and training. [S2, S3, S4] {ii, iii}

4.5.10 Once the suppliers are selected EA1 will start a programme of project skills and training assessment workshops with key suppliers to discuss skills/training needs and share lessons learned. Regular workshops/events will be set up to coordinate activities across the supply chain. [S2, S3, S4] {ii, iii}

4.6 Sharing best practice and lessons learned [S5]

4.6.1 **Transferring skills to future projects -** EA1 is developing up to eleven similar projects (in addition to the EA1 Project) in the EA Zone in addition to the wider offshore wind pipeline of 3.2GW being developed by the parent companies. The EA1 Project will allow the transfer of valuable learning each of these future projects. This is especially pertinent in the case of the wider EA zone which has similar favourable physical characteristics and the opportunity to repeat learning from the EA1 Project. [S4,S5] {ii, iii}

4.6.2 **Health & Safety skills & knowledge transfer –** EA1 via its parent organisations is an active contributor to the following health and safety initiatives which share information and best practice for the wider benefit of the industry which will result in safer working practices offshore and reduce accident numbers. [S5] {ii, iii}

- ***RUK Offshore Renewable Energy Emergency Forum (OREEF)*** – OREEF coordinates emergency preparedness for offshore wind accidents. Participants in OREEF include Government organisations, regulators, agencies, emergency services, industry and service providers. The main function of the group is to communicate and share best practice in the area of offshore emergency response.
- ***RUK Offshore Health and Safety Committee*** - This committee has been established to discuss the major health and safety issues related to working in the offshore wind industry. A key output of this Group is

Health and Safety Guidelines which provide information & best practice on technical, legal and policy issues. SPR has been part of the process that created and reviewed these guidelines.

- ***G9*** – SPR is one of a Group of 9 offshore wind developers that established the G9 Offshore Wind Health and Safety Association (G9) in 2010. The aim of the G9 is to create and deliver world class health and safety performance across the offshore wind industry. G9 member companies have committed resources from their own company to actively lead the industry in finding solutions to the safety challenges that offshore wind projects face. The G9 have produced three guidance documents: Working at Height, Marine Operations and Lifting Operations. These are due for publication towards the end of 2014.

4.7 Impact

4.7.1 The actions described above address all of the criteria relating to skills, as outlined in Annex 1. EA1 is using opportunities provided by such a large project, at 600MW and close to other existing and planned projects to implement actions that either would not be possible or would be less impactful on a smaller or more standard project. {ii, iii}

4.7.2 The key skills impacts of the EA1 Project will been driven by a skills letter of intent, outline skills strategy and subsequent delivery activities: {ii, iii}

- A skilled workforce peaking at 1,500 – 3,000 people to deliver the EA1 Project, which have high potential to become long term sustainable roles through delivery of future EA zone and other offshore wind projects over a 10 -15 year construction period.
- Significantly accelerated relevant skills development activities in Norfolk, Suffolk and Essex through a wide range of local service providers and regional and national skills initiatives from work in primary schools through youth apprentices and graduate programmes to adult retraining.
- Increased numbers of the workforce skilled in delivery of HVDC solutions which will benefit future far from shore offshore windfarms.
- Increased local educational attainment particularly in the STEM subjects, impacting positively on local employment, productivity and economic growth whether in offshore wind or not.

4.7.3 Again, EA1 has considered the impact of the EA1 Project on the wider industry in detail for six different types of project, as described in Annex 6. Very strong benefit applies to other EA Zone windfarms and offshore windfarms owned by others that are local to the EA Zone. Due to the mobile nature of much of the workforce and transitory nature of construction work, benefits also transfer well to offshore windfarms located elsewhere and to some extent to the wave and tidal sectors and the wider low carbon generation sector. Engineering skills in HVDC technology are relevant well beyond the EA1 Project. {ii, iii}

Annex 1 List of Impact Criteria

In DECC's *Supply Chain Plan Guidance Document,* April 2014, it is suggested to set out how the project will deliver against the impact criteria below. For ease of assessment, where the plan addresses the criteria this has been highlighted, combined with a reference to the provision of related evidence where applicable.

Competition

[C1] Encourage broader supply chains by supporting new entrants to the sector

[C2] Identify and remove barriers to entry for new supply chain companies, where these are within the scope of the projects

[C3] Share best practice and lessons learned

[C4] Improve awareness of the commercial opportunities among both companies that currently supply to the relevant low carbon generation sector and those that have the capability to do so, but have not yet entered the market or have not yet reached critical mass

[C5] 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

Innovation

[I1] Research and development, including links to universities and any examples of testing and demonstration

[I2] Technological development

[I3] Innovative procurement or contracting practices- for example, allowing less established products or processes to win part of a contract or co-investments in the supply chain which will reduce or manage the allocation of risk in such a way that it supports new entrants or less established partners

[I4] Innovative or new installation methods

[I5] Any other practice that is justified as innovative by the project (and its supply chain) or that would boost innovation in the sector- for example, in the build/installation process, the technology used or the way the project is operated

[I6] Examples where the applicant has, or intends to, share best practice and lessons learned

Skills

[S1] An assessment of the future skills requirements at each stage of the project (design, construction- including the major supply components, and operation and maintenance of the life of the project)

[S2] An assessment of whether these skills are currently in place and what, if any, gaps there are

[S3] A set of actions that will provide investment in skills and training in order to meet the future needs of the project- as estimated at each stage

[S4] Plans that the project intends to put in place to maintain and develop the skills necessary for the lifetime of the project

[S5] Examples where the applicant had, or intends to, share best practice and lessons learned

Annex 2 Evidence

A. Table 1: Windfarms owned by Vattenfall / SPR that are in operation or under construction

Windfarm	Owner(s)	Country	Rating (MW)	Status	First operational [*Anticipated*]
Lely	Vattenfall	NL	2	Operating	1994
Irene Vorrink	Vattenfall	NL	16.6	Operating	1996
Utgrunden 1	Vattenfall	SE	10.5	Operating	2001
Horns Rev 1	Vattenfall	DK	160	Operating	2002
Yttre Stengrund	Vattenfall	SE	10	Operating	2002
Kentish Flats	Vattenfall	UK	90	Operating	2005
Egmond aan Zee	Vattenfall	NL	108	Operating	2007
Lillgrund	Vattenfall	SE	110.4	Operating	2007
Alpha Ventus	EWE, E.ON,Vattenfall	DE	60	Operating	2010
Ormonde	Vattenfall	UK	150	Operating	2011
Dan Tysk	Vattenfall	DE	288	Construction	*2014*
West of Duddon Sands	SPR, DONG	UK	389	Construction	*2014*
Kentish Flats 2	Vattenfall	UK	49.5	Construction	*2016*
Total			**1,444**		

B. Table 2: Windfarms owned by Vattenfall / SPR that are in development.

Windfarm	Owner(s)	Country	Rating (MW)	Status
East Anglia ONE / 2nd phase	SPR, Vattenfall	UK	600	In development
East Anglia Three	SPR, Vattenfall	UK	1,200	In development
East Anglia (2,4,5,6)	SPR, Vattenfall	UK	4,800	In development
Strom-Nord	Iberdrola	DE	270	Consent applied
Nordpassage	Vattenfall	DE	400	Consent applied
Sandbank	Vattenfall	DE	288	Consent authorised
Sandbank Extension	Vattenfall	DE	240	Consent applied
Wikinger Nord	Iberdrola	DE	40	Consent applied
Wikinger	Iberdrola	DE	350	Consent applied
Wikinger Sud	Iberdrola	DE	65	Consent applied
Saint-Brieuc	Iberdrola	FR	500	In development
Kriegers Flak 2	Vattenfall	SE	640	Consent authorised
Taggen	Vattenfall	SE	300	Consent authorised
Trolleboda	Vattenfall	SE	150	Consent authorised
Total			**9,843**	

C. List of key mechanisms relevant to EA1 in developing its supply chain

- Offshore Wind Investment Organisation, a cross-government team working to make inward investment happen, part of UKTI.
- Regional Growth Fund which supports projects and programmes in England to create private sector employment between now and 2022. The payment of Regional Growth Fund money is spread between 2011 and 2017 and is used to lever private sector investment to create economic growth and sustainable employment. A range of offshore wind players have applied to access such support in the past.
- GROW, a programme to support English businesses seeking to enter the offshore wind market, sponsored by BIS
- Programmes broadly similar to GROW, but for Scotland, Northern Ireland and specific English regions, including Supply Chain innovation for Offshore Renewable Energy which is a £2.5M programme, part financed by the European Regional Development Fund, which supports SMEs in the East of England who are developing innovative products or services in the area of offshore renewable energy.
- Offshore Renewable Energy Catapult, once it establishes its SME support programme.
- RenewableUK and Scottish Renewables' generic support and networking opportunities.
- English Centres for Offshore Renewable Engineering, especially the local Enterprise Zone at Great Yarmouth and Lowestoft.
- New Anglia Local Enterprise Partnership which covers Norfolk & Suffolk.
- EEEGR which is the industry association for energy in the East of England.
- Scottish Enterprise and Scottish Development International

D. **Anticipated UK content for EA1 Offshore Windfarm**

EA1 has undertaken analysis of the likely UK content of the EA1 Project over the lifetime of the windfarm. The purpose was to understand what actions EA1 should take in achieving its target of 50% lifetime UK content.

EA1 has applied the principles of the UK content methodology currently under consideration by the OWPC and OWIC, in that it considers as far as possible the share of the expenditure captured by UK-based companies at each tier of the supply chain.

Two scenarios have been developed:

- the first, low scenario is that EA1 is passive in its procurement process; and
- the second, high scenario, is where EA1 is active with its supply chain to maximise the participation of UK companies.

In all the packages that EA1 intends to award, at least two suppliers are under currently consideration. In building each scenario, EA1 has developed a low and high scenario for each possible supplier. It further considered the probability of each supplier being successful in winning the contract and this probability was used to calculate a weighted average for each package. The results of this analysis are shown in the table below.

Package or activity	Lifetime expenditure	Low (EA1 passive)	High (EA1 active)
EA1 costs pre-FID	3%	80%	80%
EA1 internal costs from FID to works completion	3%	80%	90%
Turbine supply (excluding project execution)	16%	19%	29%
Turbine installation (including project execution)	3%	16%	26%
Foundation design	0%	50%	50%
Foundation and pile fabrication	8%	25%	53%
Foundation installation	4%	5%	10%
Array cable installation	2%	14%	28%
Array cable supply	1%	16%	26%
Grid transmission	23%	13%	29%
CAPEX	**63%**	**22%**	**35%**
Turbine O&M	21%	65%	75%
Other O&M	3%	75%	85%
Fixed OPEX: insurance, rent TNUoS	14%	79%	85%
OPEX	**37%**	**71%**	**80%**
Lifetime total	100%	40%	52%

UK content in lifetime expenditure is 40% and 52% for the low and high scenarios respectively. Opportunities to increase the UK content in OPEX are primarily associated with the choice of major component manufacturer and it is therefore in the CAPEX phase where procurement decisions to increase UK content need to be made.

Under the low scenario, UK content in CAPEX is 22%, rising to 35% in the high scenario. EA1 understands that the average UK content in CAPEX for UK offshore windfarms built so far is about 20%. In EA1's low scenario, there is significantly higher UK content in turbine supply, reflecting announced or expected UK investments by turbine

manufacturers or their main suppliers. In contrast, UK content in the grid transmission is lower than many UK offshore windfarms built so far because EA1 is uncertain whether the UK has the capability to manufacture the DC converter station platform, which is a significant cost to the project.

EA1's main opportunities for increasing UK content lie in turbine supply, grid transmission, and foundation and pile fabrication. For turbines, the high UK content scenario could be achieved if EA1 bought turbines that were assembled in the UK and used UK manufactured blades and towers.

For foundation and pile fabrication, much of the supply can be captured by UK suppliers, requiring only the import of raw materials and tooling and, in theory, UK content in foundation and pile fabrication can approach 85%. In EA1's view, however, UK fabrication facilities may not have the annual capacity to supply the 85 or so units needed by the EA1 Project. In the high scenario, the UK content is therefore 53%, reflecting supply from a combination of UK and non-UK suppliers.

For grid transmission, the higher scenario can be achieved if engineering and project management is undertaken mainly in the UK.

EA1 intends to keep track of progress using the above format, as decisions are made and more detailed information is provided.

E. Table 9: Local skills support identified by EA1.

Local skills support	Offering
Norfolk Suffolk Energy Alliance (NSEA)	Dedicated Inward Investment Director, James Gray, who provides a single point of contact for potential investors including providing information on skills availability, training programmes through the local colleges and the industry led Skills For Energy programmes.
Skills for Energy Partnership	Supported by many of East Anglia's major energy employers including Seajacks, Perenco, Shell, ODE, EDF, SSE, The Crown Estates, 3Sun/Dawson, CLS and SLP. Successful pilot that leads programmes to attract people into the industry including offshore wind and provide paths in for all skill levels.
Great Yarmouth and Lowestoft Centre for Offshore Renewable Engineering	Partnerships between Central and Local Government and Local Economic Partnership that ensure businesses looking to invest in manufacturing for the renewables industry receive the most comprehensive support possible.
New Anglia Local Enterprise Partnership	Works with businesses and public sector partners, to help grow jobs in Norfolk and Suffolk. If formed and manages the Great Yarmouth and Lowestoft Enterprise Zone, helps fund business growth and showcases examples of best business practice.
East of England Energy Group (EEEGR)	The industry association for energy in the East of England, representing over 400 members across the supply chain.
Energy Production Innovation Skills Centre	The EPIS Centre a new skills energy skills training centre based in Great Yarmouth that opened in July 2014. Initially the centre will provide training rooms as well as offices and meeting rooms for skills providers. A new warehouse with industrial equipment to support the training is expected to open early 2015.
Norfolk University Technical College (UTC),	Specialising in advanced engineering and energy
Nexus Engineering	Nexus provides training and learning opportunities for learners of all ages with a focus on the skills and knowledge required for the growing sectors of Engineering and Advanced Manufacturing
Colchester Institute	Colchester Institute is the largest vocational college serving North Essex and the surrounding areas

ANNEX 2

F. Supply Chain Employment Opportunity

The table below sets out projected employment levels (FTE basis) during the construction phase of the EA1 Project. These estimates are based on information obtained from the supply chain in the course of EA1's market engagement activities.

Table: Projected employment totals based on supplier information

Package	2016	2017	2018	2019	2020	2021
Turbines		900	900			
Foundations	100	1,000	1,000			
Substations		250	400	400		
Array Cable		50	50			
Installation			850	850		
O&M				70	70	70
Totals	**100**	**2,200**	**3,200**	**1,320**	**70**	**70**

The totals above exceed the peak total of around 1,400 FTEs calculated using the methodology used to inform EA1's consent submission. The difference is due to the different basis of calculation employed in the two projections. The socio economic study (used to inform the consent submission) used industry benchmarks based on MW of installed generation, compared to the direct estimates provided by the supply chain.

We recognise that the forecasting of such information is not precise, however, we are satisfied from the information presented to us that EA1's employment target of between 1,500 – 3,000 jobs is achievable.

Further notes around the basis of the supplier employment projections received are set out below:

Wind Turbine Generators (WTG)

The employment opportunities created by the manufacturing of wind turbine generators for the EA1 Project could be up to 1000 FTE depending on the turbine solution. The manufacturing will be followed by offshore installation and commissioning during which up to a further 170 positions could be produced. Depending on the turbine solution around 70 operations and maintenance personnel will be required for the lifetime of the assets, which is currently envisaged to be 25 years.

WTG Foundations

The employment opportunities created by the fabrication of WTG Foundations for the EA1 Project are estimated to be approximately 1,000, depending on the manufacturing solution.

Electrical Substations

The employment opportunities created by the construction of the on and offshore electrical substations are unclear at present; however requirements are estimated to be approximately 400. These positions will be multi discipline (as detailed in Annex 5) and will be located at the onshore substation location and in offshore platform fabrication yards.

Array Cable

The employment opportunities created by the manufacturing of array cable for the EA1 Project are estimated to be approximately 50 depending on the manufacturing solution. Further analysis is required to understand the scope of the offshore installation however this will create further employment opportunity.

Foundations & WTG Installation

The employment opportunities created by the installation of the WTG Foundations and WTG's for the EA1 Project range from 600 to 1200, depending on the installation solution.

Summary

Based on this latest analysis the employment opportunities created by the EA1 Project could be as much as 3,500 during the on and offshore construction, followed by the operational phase which could see 70 positions created for up to 25 years.

G. Table 10: Skills Development Initiatives Underway

Initiative	Target	Input to date	Intended Outcome or Result
Engineering your STEM Future	Aimed at 15-17 year olds	EA1 has provided key note speakers & STEM Ambassadors	Illustrates the diverse careers available to engineers
STEM Taster Day	Aimed at 14-16 year olds	EA1 working in partnership with STEM.net	STEM taster days
Engineer Career Carousel	Aimed at 14-16 year olds	EA1 partners attend and provide information on opportunities	Provides a brief introduction to engineering roles with energy industry
Grangemouth Science Festival	Aimed at 10-11 year olds	12 days of proactive engagement with approx. 2000 young people	Promote Maths and Science key subjects for the Power Industry
Go4Set Programmes	Aimed at all ages	EA1 Partners sponsor the project & provides support over 10 weeks by supplying STEM ambassadors to assist.	Promote STEM for the Power Industry
Skills for work	Aimed at 15-16 year olds	Students are partnered with a business	Provide insight into the working environment
National Apprentice week	Aimed at 14-16 year olds	EA1 Partners host taster days for young people as well as provide online content	Promote the current apprentice programmes
Science at Work	Aimed at 12-17 year olds	EA1 Partners sponsors	Showing how science is put into practice in the working environment
Big Bang	Aimed at 12-17 year olds	EA1 Partners sponsors	engage and enthuse young people about STEM subjects
Careers Transition Partnership day	Ex services	Together with the Careers Transition Partnership EA1 Partners support taster days to Ex Service personnel	encourage Ex Service Personnel to think about pursuing a career in the power industry
Career Academy Placements	Aimed at 15-16 year olds	EA1 Partners have supported placements for people interested in engineering	One month placements for students
Career Wales	Aimed at 12-17 year olds and career	EA1 Partners participate in the event	Engagement with career influencers and young

	influencers		people
World Skills	Aimed at 8-17year olds	EA1 Partners support the Environment competition	Providing interactive activity as well as career advice
Graduate Careers Fairs	Aimed at 17+year olds	EA1 Partners attend a number of graduate fairs	Promote the graduate programmes currently on offer
Teachers Day in Industry	Aimed at Career influencers	EA1 Partners support and use training facilities	Promote opportunities for younger people in the power industry

H. Innovation Projects websites – Involvement of EA1 set out in section 3 (Innovation)

Project/ Initiative	Website
DEPONS project	http://depons.au.dk/
CEFAS	http://cefasmapping.defra.gov.uk/Map
OWA Floating Lidar validation	http://www.carbontrust.com/media/422195/ctc819-owa-roadmap-commercial-acceptance-floating-lidar-technologies.pdf
TWENTIES project	http://www.twenties-project.eu/node/1
Network Innovation Allowance (NIA)	https://www.ofgem.gov.uk/network-regulation-%E2%80%93-riio-model/network-innovation/electricity-network-innovation-allowance
ORE Catapult	https://ore.catapult.org.uk/
ORI	http://offshorerenewables.ac.uk/
ORJIP	http://www.carbontrust.com/orjip
OWA	http://www.carbontrust.com/our-clients/o/offshore-wind-accelerator#case-offshore-wind
Power Networks Demonstration Centre	http://www.strath.ac.uk/pndc/
Technology Strategy Board (TSB)	https://www.innovateuk.org/
TIC	http://www.strath.ac.uk/tic

ANNEX 2

Annex 3 Supply Chain Case Studies

3.1 East Anglia Met Masts

Overview

In order to accurately predict the wind resource available in the EA zone, EA1 installed two met masts.

The Shareholders sought to capture learning from the delivery of the met masts, but also seized upon the opportunity to work with new suppliers to the renewable energy industry – thus supporting longer term goals of expanding support for UK project delivery.

The masts were technically challenging, but also presented a significant supply chain opportunity, being installed in 43m of water depth, reaching to a height of over 100m and located 40 to 60 miles from the nearest ports.

Through the delivery of the met masts the Project achieved the following successes:

Competition

- Main contract awarded on EPC basis following broad market engagement exercise. 7 tenders received. Standard contract terms and conditions adjusted in some areas to allow wider participation in delivery.
- The Wood Group was awarded the main contract for supply and installation, equating to £17M. Expanding the UK Supply Chain by giving an opportunity to an established UK Oil and Gas company to bring their knowledge and experience to the renewables sector.
- Steel Engineering and TAG awarded sub-contracts for the major elements of manufacturing. UK manufacturers achieved the awards for monopile and transition piece delivery.

Innovation

- At over 40m water depth, one of the deepest water monopiles installed in the renewables industry. Conical shape employed in design to save costs and reduce weights – learning employed on other projects.
- Design was executed by Ramboll in their London office. Technical review was also UK based, (Offshore Design Engineering, GHGL and London Offshore Consultants).
- Integrated monopile and met mast design determined by the Shareholders in house team of experts. Integrated design safer and more robust than separate designs that have been prone to failure.

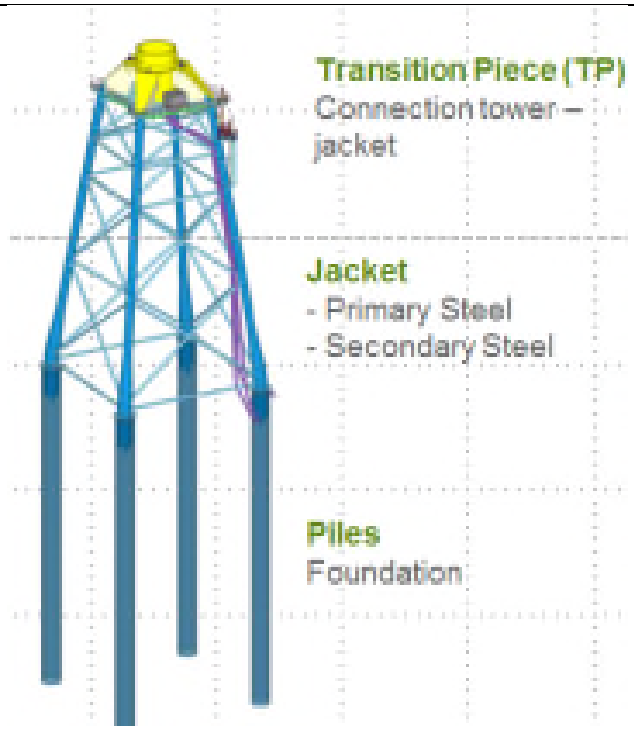
Skills

- Utilisation of East Anglia ports for O&M support – 5 years planned.
- Development of new integrated design techniques, which will deliver long term solutions that are more robust and cost effective than the traditional approach.

3.2 Wikinger Jacket Foundations – new entrant supplier

Overview

- Wikinger is a 350MW project located in the Baltic Sea wholly owned by SPR
- Wikinger comprises 70 AREVA M5000 WTGs that will be located in water depths ranging from 36m to 42m. Two foundation types have been proposed (Deep, Type A, and Shallow, Type B), each foundation covering a water depth range of 3 metres.
- Given the size of the fabrication order, two suppliers were required to address the scope of supply.



Competition

- A competitive tender process was carried out with nine suppliers participating. The process included several rounds of clarifications, face to face discussions and a visit to the Bidder´s facilities to be used for the Project.
- Following detailed negotiations it was determined that Navantia would be one of the preferred suppliers for the project and will have responsibility for fabricating 29 jacket foundations. This contract is expected to be in the region of £58M (€70M).
- The award of this contract to Navantia is significant given that it is a new supplier to the offshore wind market and demonstrates the potential to transfer skills from other industries (in this instance ship design and construction) to create new capacity in the offshore wind market. This is particularly welcome in the jacket fabrication supply chain which is a particularly constrained area of the market.
- This contract will allow Navantia to reuse one of the largest assembly yards in Europe as well as highly qualified engineers on a new business with huge expectations of growth.

Innovation

- Wikinger will be the largest offshore wind project with jacket foundations at the time of construction.
- Due to small numbers of experienced foundation suppliers, ship builders were invited to prequalify with several being invited to tender. Multiple transition piece options were reviewed and with ship building insights applied EA1 has been able to optimise this part of the scope.

Skills

- Development of new method statements and design optimization, using assembly-line techniques which will deliver long term solutions for serial production of foundations and skills transfer to future projects.

3.3 West of Duddon Sands – Belfast Harbour

Overview

Belfast Harbour is the first bespoke offshore wind installation and pre-assembly harbour in the UK, and is part of the Harbour's wider plans to create a renewable energy hub.

DONG and SPR leased the Harbour for the construction of the West of Duddon Sands (WoDS) offshore windfarm – a 50/50 joint venture between the two parties. This agreement resulted in a £50M investment by Belfast Harbour to develop a new terminal for the assembly of offshore wind turbines and provided a major boost for the Northern Ireland construction and aggregate sectors.

The 50-acre facility was used to support the construction of the WoDS offshore windfarm.

SPR and DONG have supported this excellent new facility, which will benefit the future deployment of offshore wind and other sectors such as wave and tidal, in coming to market.

Competition

- Prior to selecting Belfast Harbour as the preferred construction harbour, SPR and DONG considered various other options and engaged with other prospective ports.
- Northern Ireland-based Farrans (Construction) Ltd was awarded the contract to deliver the new terminal by the Belfast Harbour Company.
- SPR supported Belfast Harbour Company at all stages during the harbour construction.
- Construction works successfully executed from the site.

Innovation

- A deep water port with no tidal restrictions offering 24/7/365 access.
- The 50-acre terminal, located on the County Down side of the Port, is the largest single investment in Belfast Harbour's 400-year history.
- The 200,000 m^2 facility, is large enough to accommodate 30 football pitches.
- Up to three vessels will be able to berth simultaneously with access available around the clock helping optimise the installation plan of offshore windfarms.

Skills

- The offshore wind industry plans to install a large number of turbines within 150 miles of Belfast Harbour, thus making it well positioned geographically to facilitate the establishment of a reliable supply chain upon which to deliver this offshore wind capacity and create a sustainable local skilled workforce.

3.4 West of Duddon Sands – Pacific Orca

Overview

SPR and DONG have an agreement in place with Swire Blue Ocean (Swire), which covered a charter for the installation of the West of Duddon Sands (WoDS) project.

This arrangement is a charter of a wider framework agreement between DONG and Swire covering three projects in total. By providing the commitment to work on the WODs project and a further two DONG projects, this agreement resulted in Swire investing in a state of the art offshore wind installation vessel, The Pacific Orca (The Orca). The Orca, is a model specific second generation jack-up for offshore wind which works in most adverse sea conditions, reduces the times between positions and has a higher load capacity. The Orca was used to install the monopile foundations and associated equipment for the WoDS project.

This vessel has added supply capacity in a constrained area of the market and will be utilised by the future pipeline of offshore wind projects.

Competition

- A competitive tender process was launched by SPR and DONG for the supply of an installation vessel for three projects which included WoDS. Seven vessel suppliers participated in the process.
- Following this process it was determined that Swire, a new supplier to the offshore wind market, was the best choice for the project.

Innovation

- Capable of carrying and installing up to 12 wind turbine generators each rated at 3.6MW, or 10 foundations, the Orca is the biggest windfarm installation vessel in the world.
- The vessel can be deployed to conduct windfarm installation even under extremely rough weather and sea conditions. She is designed to withstand wind velocity of 65.6ft per second and significant wave heights of 8.2ft.
- The vessel facilitates installation of offshore WTGs to a maximum depth of 197ft. She also allows installation of windfarms with ultra-large WTGs rated at 10MW or higher capacity.
- The vessel can be floated up to 56ft above the surface of the ocean using six jack-up legs fastened to the seabed. Each leg measures approximately 345ft in length.
- Pacific Orca provides accommodation for 111 people in single cabins.
- The overall length of the vessel is 527.9ft.
- The vessel's dead weight at 18ft draught is 8,400t.

Skills

- New crew trained for this second generation jack-up and the state of the art technology, e.g. the cranes.
- The learning on this project is transferrable to future projects, i.e. the crew.

Annex 4 Supplier Engagement

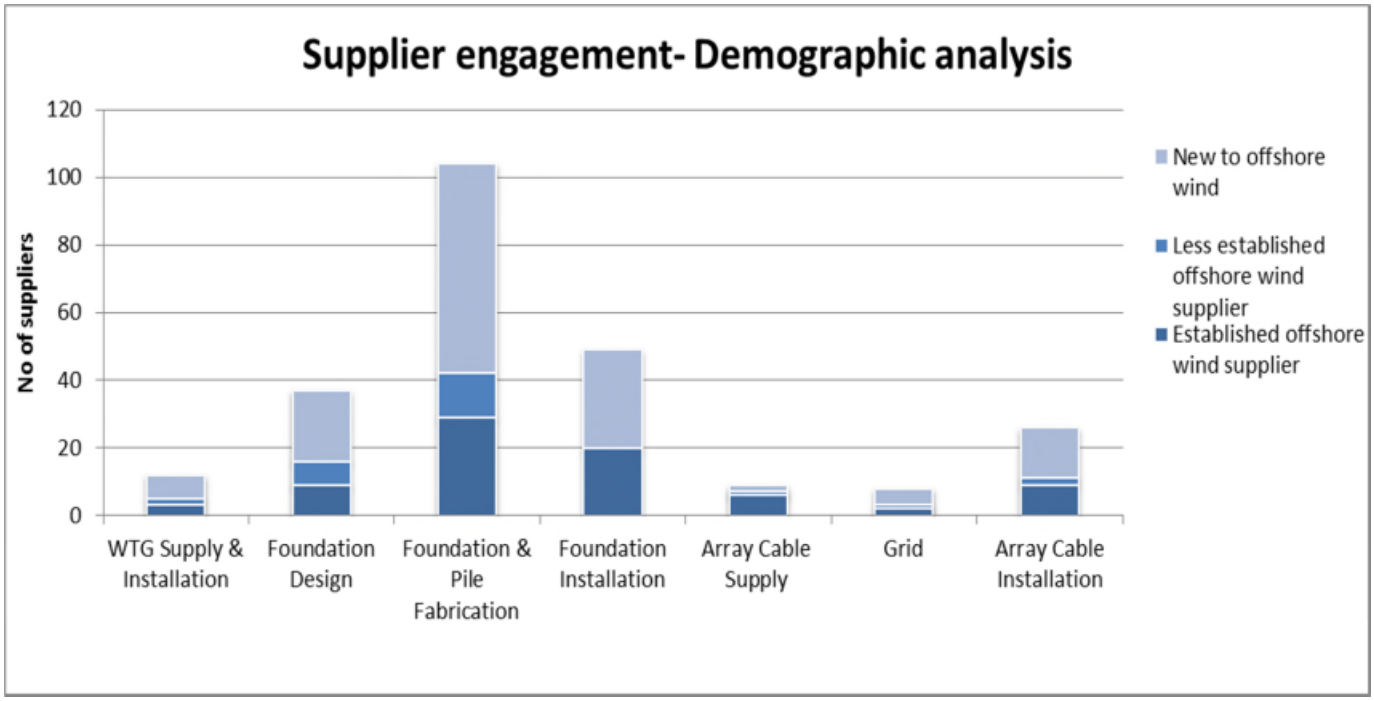
Supplier Engagement Classifications

EA1 has recorded details of each of the suppliers that it has engaged with and considered as a potential supplier for the EA1 Project. To help illustrate the nature of the suppliers it has engaged with, EA1 has prepared an analysis (set out below) which categorises each supplier into three headings (1) Established, (2) Less established, (3) New to offshore wind. EA1 has defined less established suppliers are those who are considered to have only a small number of credentials (i.e. involvement in fewer than 4 projects) in the offshore wind market to date. This is a general rule of thumb which may vary for each package considering the maturity of the product and the market for it. Whilst this categorisation includes some subjectivity, on balance EA1 considers that the conclusions reached are representative of the supplier demographic that it has engaged with. Suppliers with no offshore wind credentials are classified as 'New' to offshore wind. Suppliers who have been involved in a greater number of offshore wind projects (four or more) are classified as 'Established'.

Summary tables

All suppliers engaged through Market engagement activities

		Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
	No suppliers	Established offshore wind supplier	Less established offshore wind supplier	New to offshore wind	Established offshore wind supplier	Less established offshore wind supplier	New to offshore wind
WTG Supply & Installation	12	3	2	7	25%	17%	58%
Foundation Design	37	9	7	21	24%	19%	57%
Foundation & Pile Fabrication	104	29	13	62	28%	13%	60%
Foundation Installation	57	20	0	29	35%	0%	51%
Array Cable Supply	9	6	1	2	67%	11%	22%
Grid	8	2	1	5	25%	13%	63%
Array Cable Installation	26	9	2	15	35%	8%	58%
	253	**78**	**26**	**141**			



Suppliers invited to respond to Pre Qualification Questionnaire

		Grade 1	Grade 2	Grade 3		Grade 1	Grade 2	Grade 3
	No suppliers	Established offshore wind supplier	Less established offshore wind supplier	New to offshore wind		Established offshore wind supplier	Less established offshore wind supplier	New to offshore wind
WTG Supply & Installation	6	3	2	1		50%	33%	17%
Foundation Design	8	8	0	0		100%	0%	0%
Foundation & Pile Fabrication	47	18	8	21		38%	17%	45%
Foundation Installation	24	14	3	7		58%	13%	29%
Array Cable Supply	9	6	1	2		67%	11%	22%
Grid	4	2	1	1		50%	25%	25%
Array Cable Installation	N/A - not launched		N/A	N/A		N/A	N/A	N/A

ANNEX 4

Annex 5 Example Roles Required

Potential Roles

The EA1 project will require various roles throughout the project phases (Design, Construction and Operations). Examples of roles that may be required in both the EA1 project team and the Supply Chain are included below for reference.

Project Wide Support

Design (& Procurement)

Project Management, Document Control, Risk Management, Change Manager, Interface Manager, Project Controls Manager, Project Programmer, Metocean Manager, Geotechnical Manger, Certification Manager, Insurance Liaison, CDM (Construction, Design Management) representative, CDM Coordinator Engineering Management, Site Optimisation Manager, Layout Design Engineer, Wind Resource Analyst, CAD (Computer Aided Design) Technician, Supply Chain & Procurement Management, Contract Manager, Administrator, etc.

Construction (On & Offshore)

Project Management, Engineering Management, Construction Management, Commissioning Manager, Site Representative, Rigging & Lifting Engineers, Vessel Manager, Marine Co-ordinator, Yard Supervisor, Marine Warranty Surveyor, Fisheries Liaison Manager, Welding Supervisors, Coating Inspectors, Quality Assurance Manager, Quality Assurance Representatives, Health & Safety Representatives, Structural Engineer, Graduate Engineers, CAD Technicians, Supply Chain & Procurement Management, Contract Managers, Administrators, Network Controller, Permit Coordinator, etc.

Wind Turbine Generators

Design (& Procurement)

Project Management, Interface Manager, CDM representative, Engineering Management, SCADA (Supervisory Control & Data Acquisition) Engineer, Supply Chain & Procurement Management, Contract Manager, Administrator, etc.

Construction (On & Offshore)

Project Management, Engineering Management, Construction Management, Commissioning Manager, Site Representative, Rigging & Lifting Engineer, Vessel Manager, Marine Coordinator, Yard Supervisor, Marine Warranty Surveyor, Fisheries Liaison Manager, Welding Supervisors, Coating Inspectors, Quality Assurance Manager, Quality Assurance Representatives, Health & Safety Representatives, Structural Engineer, CAD Technicians, Supply Chain & Procurement Management, Contract Managers, Administrators, Network Controller, Permit Coordinator, etc.

Foundations

Design (& Procurement)

Project Management, Interface Manager, CDM representative, Engineering Management, Structural Engineer, Graduate Engineer, CAD Technician, Geotechnical Engineer, Supply Chain & Procurement Management, Contract Manager, Administrator, etc.

Construction (On & Offshore)

Project Management, CDM representative, CDM Coordinator, Engineering Management, Construction Management, Site Representative, Welding Supervisors, Coating Inspectors, Quality Assurance Manager, Quality Assurance Representatives, Health & Safety Representatives, Structural Engineer, Graduate Engineers, CAD Technicians, Supply Chain & Procurement Management, Contract Managers, Administrators

Fabrication Manager, Quality Assurance Manager, Health & Safety Manager, Heavy Lift Specialist, Dimensional Controller, Welding Inspector, Coating Inspector, Electrical Inspector, Plater, Welder, Pipefitter, Electrician, Riggers, Crane Driver, Scaffolder, Mate, Painter, Supervision, Rigging & Lifting Engineers, Vessel Manager, Vessel Master, Marine Coordinator, Marine Warranty Surveyor, Fisheries Liaison Manager, etc.

Array Cable

Design (& Procurement)

Project management, Cable Design Manager, Cable Route Engineer, Engineering Manager, CDM representative, CDM Coordinator, SCADA engineer, Optic Fibre Engineer, Power Core Engineer, Quality Assurance Manager, Electrical Inspector, Supply Chain & Procurement Management, Contract Manager, Administrator, etc.

Construction (On & Offshore)

Project Management, Cable Installation Manger, Commissioning Manager, CDM representative, CDM Coordinator, Engineering Management, Construction Management, Site Representative, Rigging & Lifting Engineers, Network Controller, Permit Coordinator, Vessel Manager, Vessel Masters, Marine Coordinator, Yard Supervisor, Marine Warranty Surveyor, Fisheries Liaison Manager, Quality Assurance Manager, Quality Assurance Representatives, Health & Safety Representatives, Structural Engineer, Graduate Engineers, CAD Technicians, Supply Chain & Procurement Management, Contract Managers, Administrators, etc.

Electrical Substations & HV Cable (On & Offshore)

Design (& Procurement)

Project management, Cable Design Manager, Engineering Manager, Interface Manager, Electrical Engineer, Structural Engineer, CDM representative, CDM Coordinator, SCADA engineer, Optic Fibre Engineer, Power Core Engineer, Quality Assurance Manager, Electrical Inspector, Supply Chain & Procurement Management, Contract Manager, Administrator, etc.

Construction (On & Offshore)

Project Management, Heavy Lift Specialist, Commissioning Manager, Senior Authorised Persons (SAP), Network Controller, Permit Co-ordinator, Platform Design Manager, HVDC (High-Voltage Direct Current) Grid Manager, Interface Manager, Certification Manager, Insurance Liaison, CDM representative, CDM Coordinator, Engineering Management, Construction Management, Site Representative, Rigging & Lifting Engineer, Yard Supervisor, Quality Assurance Representatives, Health & Safety Representatives, Structural Engineer, Graduate Engineers, CAD Technicians, Supply Chain & Procurement Management, Contract Managers, Fabrication Manager, Quality Assurance Manager, Health & Safety Manager, Heavy Lift Specialist, Dimensional Controller, Welding Inspector, Coating Inspector, Electrical Inspector, Plater, Welder, Pipefitter, Electrician, Riggers, Crane Driver, Scaffolder, Mate, Painter, Supervision, Vessel Manager, Vessel Master, Marine Coordinator, Marine Warranty Surveyor, Fisheries Liaison Manager, etc.

Operations & Maintenance

Design (& Procurement)

Project Management, O&M Advisors, Modellers, Supply Chain & Procurement Management, Contract Manager

Construction (On & Offshore)

Project Management, O&M Advisors, Modellers, Supply Chain & Procurement Management, Contract Manager

Operations

Site Operations Management, Control Room Management & Operator, Marine Coordinator, HV (High-Voltage)Operator, Administrator, Warehouse Coordinator, Technical Support, Health & Safety Manager, Supply Chain & Procurement Management, Marine Logistics Personnel, Helicopter Personnel, Structural & Coating Inspector, Facilities Coordinator

WTG (Wind Turbine Generator) Supplier Management Team, WTG Technician

Annex 6 Wider Impact on Low Carbon Generation industry

To maximise the value of EA1's work, we routinely consider its impact beyond a given project. This annex summarises EA1's interim conclusions in this area. In this case, EA1 has considered the impact of EA1's activities in the following specific areas:

1. Other EA zone windfarms
2. Other offshore windfarms owned by SPR/Vattenfall
3. Offshore windfarms owned by others
4. Wave and tidal projects owned by SPR/Vattenfall
5. Wave and tidal projects owned by others
6. The wider low carbon generation sector

EA1 has established that there are cross-cutting and element-specific impacts, as summarised in the tables for competition, innovation and skills, below.

Competition

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
Cross-cutting						
Development, construction and operation of a 500-600MW project, so far from shore, in relatively deep water to existing windfarms, with higher voltage array cables and potential HVDC connection.	Direct benefit in terms of learning, shared infrastructure and supply chain development for next EA projects (an additional 6.6GW). EA is the only Round 3 zone being developed according to the vision of large Round 3 zone	The learning from EA1 and supply chain development triggered also applies directly to most of SPR/Vattenfall's remaining 9.8GW offshore wind portfolio,	In terms of generic support to the development of a sustainable, competitive supply chain, impact is probably greater than any other single project	Learning in terms of project costing and infrastructure for very large scale projects. Helps develop supply chain also relevant to wave and tidal	Increases confidence in delivery of such large scale projects. Helps develop supply chain also relevant	Increases confidence in delivery of such large scale projects.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
	and given continuity of award of CfDs, staff continuity will be preserved where possible.	especially its larger Swedish and French projects. Actions are in place to facilitate this learning where confidentiality allows.	planned to be installed in UK waters before the end of 2020, due to site characteristics.	(W&T) (e.g. foundations).	to W&T (eg. foundations).	
Further development of open and transparent procurement best practice. [2.6]	Drives increased communication with us, within EA1's pool of potential suppliers and within EA1's , openness and competition, enabling a wider and stronger chain, especially in next generation wind turbines and HVDC infrastructure Drives UK supply chain development through	Many practices directly relevant to other SPR/Vattenfall projects, with same impact as Column 1.	Good practice will spread from EA1 organically, via the supply chain and through dissemination via industry collaborations such as RenewableUK and OWPB. Same impact as Column 2.	Many practices are directly relevant to SPR/Vattenfall projects. Same impact as Column 2.	Through disseminatio n via industry collaboration s such as RenewableU K and OWPB, both by us and EA1's supply chain. Same impact as Column 2.	Increases confidence of suppliers in the sector more widely. SPR/Vattenfall willing to share experiences with others and apply successful strategies themselves in related industries.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
	exposing the supply chain to full government intent, especially via supply chain plan process and OWIC/OWPB leadership on UK content reporting.					Same impact as Column 2.
Set measurable targets for lifetime UK content for EA1 and subsequent EA projects [2.1.1] Allow final supply contract decisions to be influenced by the value of UK economic benefit. During negotiations, continue to push suppliers to maximise their UK content and demonstrate their commitment to hitting UK content targets for future EA zone projects. [2.11.4]	Gives framework and early challenge to subsequent EA projects at a point in their development that enables proactive intervention to increase focus on UK content throughout the project's supply chain. Helps to build sustainable UK supply chain, hence solidifying offshore wind in policy makers' thinking.	Similar processes can be used on other UK and non-UK projects, with the same impact as Column 1 for future projects. Methods of assessing local content can be applied for other countries, to maximise	Good practice will spread from EA1 organically, via the supply chain and through dissemination via industry collaborations such as RenewableUK and OWPB. Same impact as Column 2.	All practices are directly relevant to SPR/Vattenfall projects, though Government has not yet established a similar framework. Same impact as Column 2.	Via the supply chain where overlaps exist and through disseminatio n if Government establishes a similar framework. Same impact as Column 2.	Good practice is relevant also for the sector more widely. Same impact as Column 2.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
		transparency.				
Follow up on actions from EA1's and EA1's suppliers' supply chain plans, through to completion of delivery. [2.8.2, 2.8.3, 2.11.4]	Gives ongoing challenge to project team and suppliers about translating actions into benefits, which will translate also through to subsequent EA projects and show the supply chain that SPR/Vattenfall are serious about delivery on the supply chain agenda.	Similar processes can be used on other UK projects, with the same impact as Column 2 for future projects.	Good practice will spread from EA1 organically, via the supply chain and through dissemination via industry collaborations such as RenewableUK and OWPB. Same impact as Column 2.	All practices are directly relevant to SPR/Vattenfall projects, though Government has not yet established a similar framework. Same impact as Column 2.	Via the supply chain where overlaps between sectors exist and through disseminatio n if Government establishes a similar framework. Same impact as Column 2.	Only relevant if Government establishes similar frameworks elsewhere in the low carbon sector.
Share best practice and lessons learned [2.4.2 - 2.4.6] Provide board members to key industry forums and [2.4.5]	As long as staff retained and processes put in place, then many lessons learnt are directly applicable, increasing competition, reducing risk and LCOE.	As long as confidentiality allows, many lessons learnt are applicable to other projects, with the same	Good practice will spread from EA1 organically and also with others who have lessons to share via industry collaborations	Selected elements of best practice are relevant to SPR/Vattenfall projects. Same impact as	Via industry collaboration s such as RenewableU K and OWPB. Same impact as Column 2.	Some elements relevant also for the sector more widely. Same impact as Column 2.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
		impact as Column 2 for future projects.	such as RenewableUK and OWPB. Same impact as Column 2.	Column 2.		
Collaborate with other project developers [2.4.6]	Construction and operations facilities and operational collaborations established for EA1 will be relevant also for future projects, reducing LCOE.	The main benefits are available to projects close to EA1, but some synergies may be accessible even if sites remote.	Main benefits for projects local to EA1, with same impact as Column 1.	Little or no benefit available as unlikely any projects close by.	Little or no benefit available as unlikely any projects close by.	Little or no benefit available.
Work with public stakeholders to maximise impact of public support available for suppliers, to aid investment [2.2.3, 2.5.6]	All supply chain investment for EA1 will benefit future EA projects, directly or indirectly by increasing competition and reducing manufacturing cost.	Similar benefits translate to other SPR/Vattenfall projects.	As for Column 2.	Possible benefit available but few areas of likely investment will impact W&T sector significantly.	As for Column 5.	Little benefit available.
Both SPR and Vattenfall have relocated their UK offshore teams to London to aid development of	Co-located teams offers best environment for	Projects under development	Little wider benefit.	London office also drives	Little wider benefit.	Little wider

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
the EA1 zone. Iberdrola, SPR's' parent organisation, has also chosen to establish its worldwide offshore business in the UK. [2.11.1]	sharing. UK-located teams maximise opportunity for UK companies to engage.	extend beyond EA zone. Benefits are in line with Column 1.		development of W&T projects. Benefits are in line with Column 1.		benefit.
Turbines						
Vattenfall part owns Alpha Ventus which was the first German offshore wind demonstration site in 2010, with six AREVA M5000 turbines and six Senvion 5M turbines [2.3.2] Vattenfall has been driving the EOWDC demonstration site off the coast of Aberdeen in Scotland for many years, as a key close-to-shore location for accelerating new turbines and other areas of supply to market. [2.3.2] SPR is developing one of the largest test sites in the world adjacent to its Wikinger offshore wind project in Germany. Once consented, this project will have up to 11 test sites available for turbine installation in 2016. [2.3.2] EA1 is planning to use a small area (3 to 5 turbine	De-risking next generation technology increases competition and reduces LCOE and risk for all projects, including later EA windfarms. EA1 will have direct access to verification information, where allowed under confidentiality agreements.	As Column 1, but for other SPR/Vattenfall projects.	Direct benefit to collaborators on these projects; indirect benefit to others in seeing new technology operating.	Little benefit except in development of small-scale, close-to-shore projects.	Little benefit.	Little benefit.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
locations) of EA1 as a demonstration site for turbines of the generation after those listed above, in order to accelerate competition for future offshore wind projects including the wider East Anglia zone. [2.3.2] All three shortlisted turbines have not yet been installed in commercial offshore windfarms [2.12.3]						
[redacted]	All supply chain investment for EA1 will benefit future EA projects, directly or indirectly by increasing competition and reducing manufacturing cost.	Similar benefits translate to other SPR/Vattenfall projects.	As for Column 2.	Possible benefit available but few areas of likely investment will impact W&T sector significantly.	As for Column 5.	Little benefit available.
Foundations						
EA1 has brought together specific foundation suppliers to explore partnering opportunities to strengthen their market offering and support necessary investments. [2.14.2]	All supply chain investment for EA1 will benefit future EA projects, directly or indirectly by increasing	Similar benefits translate to other SPR/Vattenfall projects.	As for Column 2.	As for Column 2.	As for Column 2.	Little benefit available.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
	competition and reducing manufacturing cost.					
Engage with EA1's chosen foundation designer to standardise and simplify aspects of the design for fabrication using learning from the Wikinger & Ormonde projects, and passing on learning from EA1 to subsequent projects. [2.4.2] For foundations on Ormonde and Wikinger projects, EA1 has introduced new suppliers to the market. [2.2.1] EA1 will be one of the largest offshore wind projects ever installed using jacket foundations and presents a significant learning opportunity for the parent companies and installation contractor. [2.15.1]	Standardisation, simplification, entry of new suppliers and sharing of learning enables increased competition and reduction of cost. Benefits obtained for EA1 are likely to be directly applicable to later EA windfarms.	Many of the benefits will be relevant for other offshore windfarms owned by SPR/Vattenfall.	Good practice will spread from EA1 organically, via the supply chain and through dissemination via industry collaborations such as RenewableUK and OWPB. Same impact as Column 2.	Many practices are directly relevant to SPR/Vattenfall projects. Same impact as Column 2.	Through dissemination via industry collaborations such as RenewableUK and OWPB, both by us and EA1's supply chain. Same impact as Column 2.	SPR/Vattenfall willing to share experiences with others and apply successful strategies themselves in related industries. Same impact as Column 2.
[redacted]	All supply chain investment for EA1 will benefit future EA projects, directly or indirectly by increasing competition and reducing manufacturing	Similar benefits translate to other SPR/Vattenfall projects.	As for Column 2.	As for Column 2.	As for Column 2.	Little benefit available.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
	cost.					
Array cables						
EA1 intends to use latest technology ~66 kV AC array cables, with associated ~66kV protection and switchgear. [2.16.1]	All supply chain investment for EA1 will benefit future EA projects, directly or indirectly by increasing competition and reducing manufacturing cost.	Similar benefits translate to other SPR/Vattenfall projects.	As for Column 2.	As for Column 2.	As for Column 2.	Little benefit available.
Transmission						
If the HVDC option is selected ,the project will be the first commercial use of HVDC technology in a UK offshore windfarm, so any contracts will significantly further develop the supply base and drive competition relevant to the UK for offshore HVDC substations and remove a barrier for the whole industry. [1.1.1]	All supply chain investment for EA1 will benefit future EA projects, directly or indirectly by increasing competition and reducing manufacturing cost. Future EA projects are anticipated to use HVDC transmission technology.	The experience gained deploying the HVDC converter platform and AC collector stations on EA1 will provide valuable learning to inform the approach being taken regarding	Although there are few UK projects planned in the short-term that are anticipated to use HVDC transmission, as experience grows, costs will fall and more projects will use it. Eventual	Use is likely to be limited to for wave farms well into the future.	As for Column 4.	HVDC technology is an enabler for transmitting large-scale renewable generation round Europe.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
		transmission options in SPR & Vattenfall's future offshore pipeline.	development of a European SuperGrid relies on significant advances in this area, so it is of strategic importance for UK to install its first windfarm using the technology.			
Installation and operation						
Share the information gathered on local ports in working with shortlisted installation suppliers to develop a cohesive strategy for shared use of ports. [2.19.1] Engage with other offshore wind developers around the East Anglia area to explore the possibility of collaborating together to use land facilities. [2.12.6] Enter discussions with other East of England	Construction and operations facilities, a vibrant local supply chain and operational collaborations established for EA1 will be relevant also for future projects, reducing LCOE.	The main benefits are available to projects close to EA1, but some synergies may be accessible even if sites remote.	Main benefits for projects local to EA1, with same impact as Column 1.	Little or no benefit available as unlikely any projects close by.	Little or no benefit available as unlikely any projects close by.	Little or no benefit available.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
developers / operators with a view to forming an "East of England Operator group" which would offer a means for developing an efficient pipeline of local suppliers during project construction/operation [2.4.6]						
We are seeking to establish as much access to data and know-how as possible during EA1's turbine contracting activities [2.20.2]	Progress made in this area will be directly relevant to other EA projects using the same turbine supplier and indirectly relevant to those using a different supplier. The benefits of availability of relevant service records, operational data and know-how are critical to driving competition in O&M.	All progress can be applied across SPR/Vattenfall's other windfarms.	Good practice will spread through dissemination via industry collaborations such as RenewableUK and OWPB. Same impact as Column 2.	Many practices are directly relevant to SPR/Vattenfall projects. Same impact as Column 2.	Through disseminatio n via industry collaboration s such as RenewableU K and OWPB, both by us and EA1's supply chain. Same impact as Column 2.	Although issues are often different, SPR/Vattenfall are willing to share experiences with others and apply successful strategies themselves in related industries. Same impact as Column 2.

Innovation

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
Cross-cutting						
Targets: Reduce the LCOE to £100/MWh by 2020 Invest an average of £3.5M per year in R&D/innovation in offshore wind Tier 1 supplier investment of an average of 3% of annual offshore wind revenues We believe the second and third targets above will result in a total expenditure of £50M on R&D and innovation attributable to the project. [3.1.2] EA1's potential tier 1 suppliers' commitment to innovation is already evident in the MOUs that have been received to date [3.1.4]	Taking a strategic view and investing long-term in R&D activity relevant to EA1 will benefit each EA windfarm in due course by helping to reduce LCOE still further, as long as momentum is preserved.	Significant investment relates to HVDC transmission and jacket foundations, relevant to a subset of SPR/Vattenfall projects. Much of the other innovation relates to almost all future projects, with impact same as Column 1.	Much of the innovation in the supply chain driven by these measures will be accessible to all. Other developers will need to follow investment in reducing LCOE as projects compete for contracts, with impact same as Column 1.	Experience in taking proactive approach will be relevant for wave and tidal projects. Limited technology innovation will be applicable.	Limited technology innovation will be applicable.	Limited technology innovation will be applicable outside of marine renewables, except for transmission technology.
Project development						
EA1 partners are involved in a range of key R&D projects, including: TWENTIES renewables integration project. Floating LIDAR validation.	Investment in innovations in project development are	Most innovations apply also to other SPR/Vattenfall projects, with	There is value in sharing results with others to increase industry	There is little knock-on benefit for wave and tidal projects.	There is little knock-on benefit for wave and tidal	Limited technology innovation will be applicable

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
Wake modelling. Bird monitoring. [3.2.1] Innovation specific to EA1 includes: Pioneering aerial survey. Specific bird monitoring. DEPONS harbour porpoise study. [3.2.2]	generally relevant to future EA projects, helping to minimise environmental footprint whilst maximising energy output and increasing certainty of construction costs.	impact same as Column 1.	understanding, especially for projects located in the southern North Sea.		projects.	outside of offshore wind.
Turbine supply and installation						
EA1 partners are involved in a range of key R&D projects, including: • Offshore test site development • OWDIN offshore wind drivetrain Innovation project. • ORE Catapult SPARTA project[3.2.3] Innovation specific to EA1 includes: First significant deployment of state-of- the-art turbines. Nacelle mounted LIDAR trials. [3.2.4]	Investment in turbine activities accessible to project developers is anticipated to have lasting impact. Deepening turbine knowledge offers benefits through the windfarm lifecycle.	All benefits are directly transferrable to other SPR/Vattenfall projects, both future and also, to some extent, those operating today.	The demonstration of next generation turbine technology is one of the most significant steps in reducing cost of energy. Operational information shared in SPARTA project	There is little knock-on benefit for wave and tidal projects.	As for Column 4.	Limited technology innovation will be applicable outside of offshore wind.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
			will improve asset management knowledge and reduce operating costs			
Foundation design, supply and installation						
EA1 partners are involved in a range of key R&D projects, including: Monopile chalk deployment research. Suction bucket foundation demonstration. Pile soil analysis project. [3.2.5] Innovation specific to EA1 includes: Placing the largest ever order for jacket foundations in the market with up to three suppliers Collaborating closely with EA1's chosen fabricator(s) to investigate how the design can be optimised for fabrication & steel weight Working with suppliers to introduce volume manufacturing techniques and methods to reduce production times, manufacturing efficiency, quality and reduce LCOE. Using lessons learned from the Ormonde project to inform EA1's approach to design	The innovations planned, coupled with the size of EA1 and future EA projects offers significant further cost reduction opportunities on these future EA projects, especially if there is time between projects to facilitate learning.	The use of jacket foundations for EA1 means that technology development for EA1 is likely to be highly relevant also for other SPR/Vattenfall projects, whether using the same fabricators and installers or not. The benefits are cost reduction and increased opportunity for UK supply in a key	Much supply chain innovation will be available to others, though some know-how will be retained by SPR/Vattenfall or shared in industry collaborations where all contribute.	Although design drivers and ground conditions are different, important learning can be applied to wave and tidal projects, with benefits in terms of LCOE.	As for Column 4, but reduced impact.	Limited technology innovation will be applicable outside of marine renewables.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
standards and promote a serial production ethos to fabrication Maximising the opportunity within the tier 2 and 3 supply chain to standardise their offering for primary and secondary material (steel pipes & tubes) Challenging EA1's installation provider to optimise the installation plan using the latest vessels and installation techniques [3.2.6]		package where today's designs are immature.				
Array cable EPCI						
EA1 partners are involved in a range of key R&D projects, including: OWA Cable Technical Working Group. TSB's Offshore Renewable Energy Catapult projects in relation to the testing of 66kV cables, fabrication techniques for new innovative foundation designs and exploring blade fatigue in relation to the offshore environment. [3.2.8] Innovation specific to EA1 includes: First to adopt new 66kV technology. Increased early engagement. [3.2.8]	Further optimisation of 66kV technology will follow early use of EA1. Future EA projects will gain most learning from EA1, helping to reduce LCOE further still, through improved reliability and optimised design.	As 66kV technology is likely to be used on all windfarms with 6MW turbines and larger, most SPR/Vattenfall projects will benefit, where information can be shared, with the same impact as Column 1.	As much of the innovation will be in the supply chain, accessible to other projects, in time benefit will spread.	Wave and tidal projects are unlikely to use offshore 66kV technology, so benefits will be limited.	As for Column 4.	Limited technology innovation will be applicable outside of offshore wind.
Grid Transmission System EPCI						
EA1 partners are involved in a range of key	This is a key area of	The learning	EA1 is	Technology is not	As for Column	Technology is

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
R&D projects and initiatives, including: First ever HVDC export platform in the UK sector. Meshed transmission networks R&D. HVDC offshore platform joint industry academic cost reduction study. Trondheim HVDC emulator. Power Networks Demonstration Centre Network Innovation Allowance, including a project looking at Low Frequency AC. ORE Catapult – EA1 case study. [3.2.9] Innovation specific to EA1 includes exploring: Improved classic 50Hz AC systems. Optimised DC solutions. Low frequency alternating current. The development of transmission technologies from 2020 to 2030. Shortlisted supplier innovation, including: HVDC breaker technology HVDC systems utilising simplified conversion technologies Gravity based structure HVDC platform Over planting (under-rating of aspects of the transmission system). [3.2.10]	learning and technology implementation relevant for future EA projects, and benefits could be potentially significant in pushing HVDC and collector technology to new levels.	gained on HVDC transmission technology will help inform the future transmission choices made by SPR & Vattenfall on their future offshore projects.	undoubtedly the most advanced UK project that will use HVDC transmission technology. Through all the collaborative projects listed, experience will be shared well between relevant players.	applicable to tidal projects. In the distant future, it may be applicable to far shore wave projects.	4.	fundamental to the growth of renewables in an integrated Europe-wide energy system.
Innovative procurement or contracting						

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
practices						
Innovation specific to EA1 includes: Tier 1 supplier commitment to competition, innovation, skills & UK benefit. [3.3.1] Turbine optimisation work stream. [3.3.2]	In addition to the good practice discussed under Competition, above, the turbine optimisation work stream will have knock-on benefits beyond EA1 in the area of greatest potential LCOE reduction available within the next 10 years or so.	Almost all benefits are directly transferrable to other future SPR/Vattenfall projects; some also to projects operating today.	The acceleration of next generation turbine technology is one of the most important areas in reducing cost of energy.	There is little knock-on benefit for wave and tidal projects, through generic learning will be relevant if Government introduces similar processed in wave and tidal.	As for Column 4.	Limited technology innovation will be applicable outside of offshore wind.
Innovative installation methods						
In addition to rows in the table above, innovation specific to EA1 includes exploring: Deep water met mast deployment. [3.4.1] HVDC substation installation. [3.4.2]	In addition to the impacts discussed in relevant packages above, the impact of these activities will be directly relevant to future EA projects.	Generally as for Column 1.	Decreased benefit unless HVDC technology (or large-scale HVAC technology) used.	Low relevance to wave and tidal.	As for Column 4.	Any technology that helps to decrease the cost of HVDC technology has a benefit to the wider sector.
Wider innovation in offshore wind						

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
In addition to rows in the table above, activities include: Active role in Offshore Wind Accelerator (OWA) exploring: Turbine foundation designs for 30-60m water depths Access systems Improving cable installation methods Electrical and transmission systems, primarily HVDC Improving the layout of large windfarms to reduce wake effects O&M and condition monitoring. [3.5.2] SPR is a founding member of The University of Strathclyde's Low Carbon and Energy Technology Innovation Centre exploring: Areas of electrical networks, Onshore/offshore wind asset maintenance Offshore foundations [3.5.3] SPR is helping to shape Offshore Renewables Institute (ORI), recently established by the Universities of Dundee, Aberdeen and Robert Gordon. [3.5.4]	These generic collaborative activities have the potential to impact future EA projects significantly. Carbon Trust has a target of reducing LCOE by 10% and other programmes will increase this.	As for Column 1.	As for Column 1, as collaboration is at the heart of much of the activity.	Selected activities will benefit the wave and tidal sectors.	As for Column 4.	Benefits beyond HVDC are likely to be limited.
Sharing of best practice or lessons learnt						

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
Presence on leading innovation groups, including OWA, ORE Catapult, ORJIP, TIC and TSB. Learning transfer on key construction packages, as set out in Section 2. [3.6]	These generic collaborative activities have the potential to impact future EA projects significantly.	As for Column 1.	As for Column 1, as collaboration is at the heart of much of the activity.	Selected activities will benefit the wave and tidal sectors.	As for Column 4.	Benefits beyond HVDC are likely to be limited.

ANNEX 6

Skills

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
Cross-cutting						
An outline skills strategy has been prepared and a structured approach is being taken, assessing needs, setting targets and planning to deliver against these. [4.1-4.3]	Taking a strategic view will benefit each EA windfarm in due course by helping to ensure skills availability and continuity, thereby maximising good practice and positively influencing LCOE and health and safety.	Learning from this approach will be applicable to other SPR/Vattenfall projects, with significant movement of staff between projects possible. The impact is similar to Column 1.	Benefits are greatest for other windfarms local to EA1, but skills are mobile, so such a significant will have an industry-wide benefit, with a similar type of impact as Column 1.	Many offshore construction skills are highly relevant. Some offshore wind skills will be applied onshore in the wave and tidal sectors, during back-at-base refurbishment, for example. It is unlikely that there will be significant projects located off the East of England, however.	As for Column 4.	Many skills gained will be relevant to the wider low carbon sector, the energy sector more generally and beyond.
A range of skills initiatives are underway and others are planned in engineering, graduate training, adult retraining, skills transfer and	EA1 provides the initial impetus, but skilled staff will	Skilled engineering and construction staff will be	As working practices harmonise	As above, we recognise sufficient	The impacts of column 3 and 4 apply.	As above. We welcome the involvement of

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
education about offshore wind, from at primary schools upwards and in conjunction with regional and national enablers. [4.4, 4.5]	then gain in competence in delivering EA1 which will further benefit future EA projects. Progressing shared initiatives alongside relevant partners under a strategic plan helps to empower training providers and ensure training is relevant for multiple opportunities.	relevant to other SPR/Vattenfall projects. A seeding of skilled O&M staff can also be used, but the long life of these jobs means that further upskilling is required to backfill. The impact of this activity is similar to Column 1.	between developers, asset owners and nations, the movement of staff trained in one environment to other organisations is likely to increase.	synergies that the wave and tidal sectors will benefit significantly from the availability of skilled practical staff with practical experience working on projects such as EA1, as those sectors start to accelerate in growth. SPR/Vattenfall expects to use these synergies internally.		partners with wider interests in order to best facilitate transfer to and from a much wider pool of people.
A 5 year plan for training and skills will be requested from EA1's suppliers as part of the tendering process. This will be reviewed along with EA1's own plans every 3 months at Project Board level with appropriate recommendations	A shared, sustained approach at a range of levels in the supply chain	Synergies and good practice of this approach will benefit and can be applied in other	The output of this approach will be beneficial to all offshore wind projects. As	For suppliers relevant to offshore wind and wave and tidal sectors, this	As column 4.	With many synergies in skills needs, especially within the

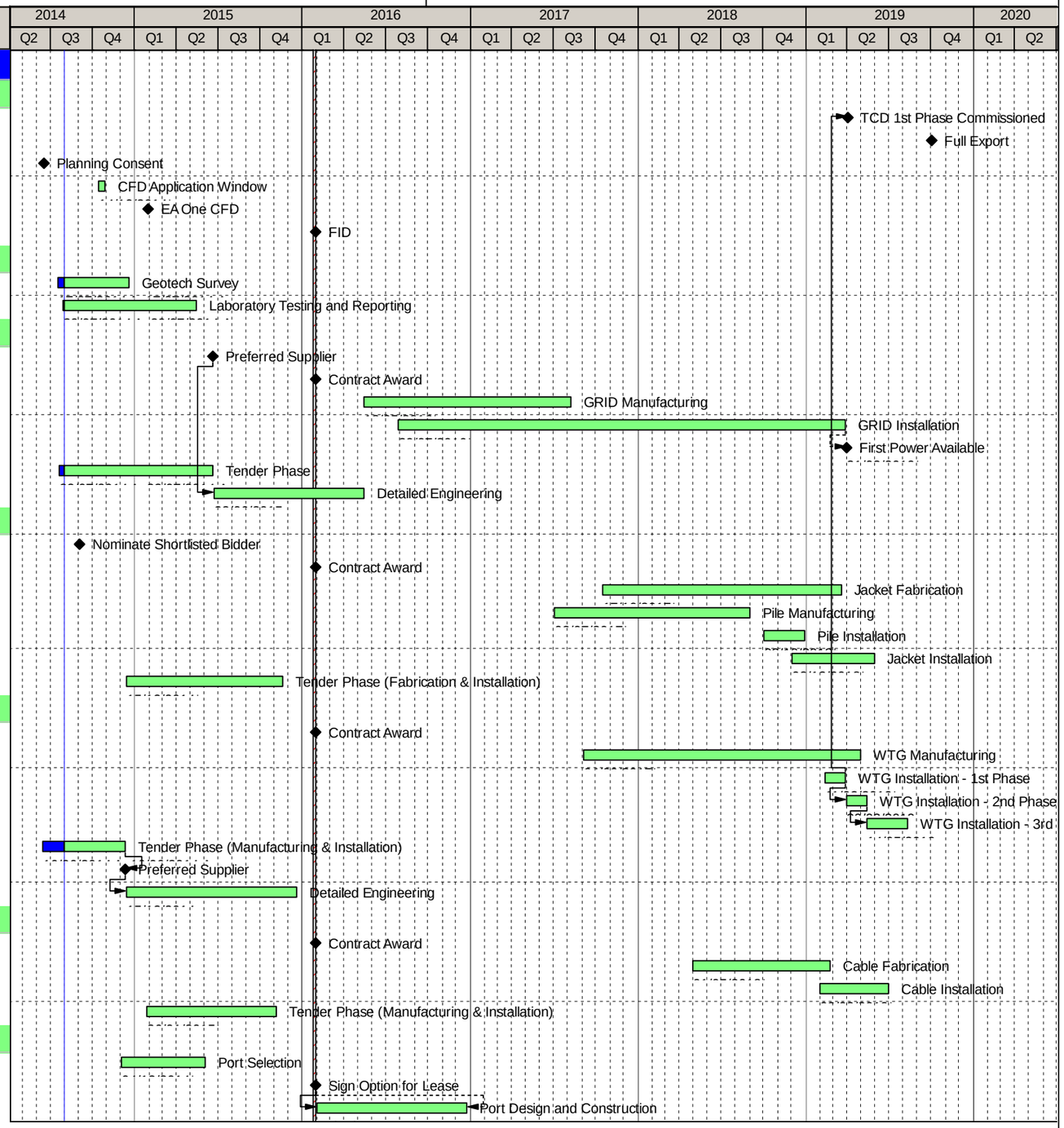
Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
and actions taken to safeguard and deliver project skills and training.[4.5.9] Once EA1's suppliers are selected, EA1 will start a programme of project skills and training assessment workshops with key suppliers to discuss skills/training needs and share lessons learned. Regular workshops/events will be set up to coordinate activities across the supply chain. [4.5.10] EA1 will work closely with its chosen suppliers, academic and enterprise bodies to ensure that adequate resource is planned and delivered to the project during the construction and the operations and maintenance phases of the project. [4.5.1]	ensures better ownership by those who most need skilled staff and who know their specific skills needs and timing of these needs. Due to the similarities in all ways of subsequent EA projects, this holistic approach will not only provide highly relevant staff for these projects, but if it continues to be implemented within those projects, will help establish long-lasting benefit for	SPR/Vattenfall projects directly. The impact will be similar to column 1.	others mirror these sorts of processes, EA1 hopes to benefit also from the movement of staff, especially local to the southern north sea, with the same impact as column 1.	approach will provide a lasting impact that we anticipate will help organisations better deliver future skills needs. We anticipate transferring good practice where relevant, recognising the scale of need is likely to remain quite different for 10-15 years and by then, the available workforce will likely have many of the skills needed, after		wider electricity generating sector, this approach will also benefit at this level.

Action	Impact					
	1. Other EA windfarms	2. Other offshore windfarms owned by SPR/Vattenfall	3. Offshore windfarms owned by others	4. Wave and tidal projects owned by SPR/Vattenfall	5. Wave and tidal projects owned by others	6. The wider low carbon generation sector
	those projects, driving down LCOE and improving health and safety records over time. We recognise also that having sufficient resources allows learning of lessons on projects to be properly and rigorously assimilated in a structured way for future use.			years of experience in offshore wind.		

Annex 7 Project Programme

EA One Delivery Plan

Activity ID	Activity Name	Original Duration	Start	Finish
EA One Delivery Plan		1283	16/06/2014 A	01/10/2019
Regulatory Dates		1282	18/06/2014 A	01/10/2019
A1180	TCD 1st Phase Commissioned	0		03/04/2019
A1190	Full Export	0		01/10/2019*
A1440	Planning Consent	0		18/06/2014 A
A1450	CFD Application Window	10	14/10/2014*	27/10/2014
A1470	EA One CFD	0		29/01/2015*
A1480	FID	0		29/01/2016*
Geotech		194	17/07/2014 A	14/05/2015
A1330	Geotech Survey	21	17/07/2014 A	19/12/2014
A1370	Laboratory Testing and Reporting	194	29/07/2014 A	14/05/2015
GRID		1156	22/07/2014 A	31/03/2019
A1000	Preferred Supplier	0		19/06/2015*
A1010	Contract Award	0		29/01/2016*
A1020	GRID Manufacturing	323	13/05/2016*	08/08/2017
A1030	GRID Installation	696	29/07/2016*	29/03/2019
A1040	First Power Available	0	31/03/2019*	
A1050	Tender Phase	1	22/07/2014 A	19/06/2015
A1210	Detailed Engineering	225	22/06/2015	13/05/2016
Foundation		1175	01/09/2014	30/05/2019
A1060	Nominate Shortlisted Bidder	0		01/09/2014*
A1070	Contract Award	0		29/01/2016*
A1080	Jacket Fabrication	352	17/10/2017*	21/03/2019
A1090	Pile Manufacturing	428	02/07/2017*	02/09/2018
A1100	Pile Installation	90	02/10/2018*	30/12/2018
A1110	Jacket Installation	180	02/12/2018*	30/05/2019
A1120	Tender Phase (Fabrication & Installation)	231	15/12/2014*	18/11/2015
WTG		1248	16/06/2014 A	12/08/2019
A1130	Contract Award	0		29/01/2016*
A1140	WTG Manufacturing	408	04/09/2017*	29/04/2019
A1150	WTG Installation - 1st Phase	47	11/02/2019*	29/03/2019
A1160	WTG Installation - 2nd Phase	45	30/03/2019	13/05/2019
A1170	WTG Installation - 3rd Phase	91	14/05/2019	12/08/2019
A1200	Tender Phase (Manufacturing & Installation)	1	16/06/2014 A	12/12/2014
A1220	Preferred Supplier	0		12/12/2014
A1230	Detailed Engineering	253	15/12/2014	18/12/2015
Array Cable		1100	26/01/2015	01/07/2019
A1390	Contract Award	0		29/01/2016*
A1400	Cable Fabrication	300	01/05/2018*	24/02/2019
A1410	Cable Installation	150	02/02/2019*	01/07/2019
A1490	Tender Phase (Manufacturing & Installation)	200	26/01/2015*	06/11/2015
Ports		514	04/12/2014	23/12/2016
A1420	Port Selection	120	04/12/2014*	04/06/2015
A1430	Sign Option for Lease	0		29/01/2016*
A1460	Port Design and Construction	230	01/02/2016	23/12/2016



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Annex 9 Outline Skills Strategy

East Anglia ONE
Offshore Windfarm

Outline Skills Strategy (V1)

Deadline III, Document for certification under article 33

21st October 2013

1 Introduction

1.1 Background

1. EAOL has provided to Suffolk County Council a Skills Letter of Intent (July 2013) (Annex 1). This letter of intent outlines East Anglia Offshore Wind's (EAOW) approach to the development of a skills strategy in relation to the East Anglia ONE Offshore Windfarm. The key principles of which are provided below. It is these principles which will be considered in discharging Requirement 38 of the proposed East Anglia ONE Development Consent Order (DCO).

2. The following requirement regarding skills forms part of the DCO.

3. Requisition 38 states that no stage of the authorised development shall commence until written details of a skills strategy have been submitted to and approved in writing by the relevant planning authority. The skills strategy shall accord with the outline skills strategy principles.

1.2 Skills Strategy Principles

4. The objectives of the strategy shall be to:

    - *To ensure the necessary balance of demand for, and supply of, professional and vocational skills to support the delivery of East Anglia ONE and to leave a legacy;*
    - *To promote employment and re-skilling opportunities in the communities most closely associated with the development of East Anglia ONE;*
    - *To utilise existing parent company skills programmes where and when possible and appropriate;*
    - *To make best use of existing local and national education and skills infrastructures and add value to these where appropriate.*

5. The strategy shall be produced and business-led by EAOW with counsel from key stakeholders, including discussions with local authorities.

6. The strategy shall set out the interventions required to maximise the opportunities for local residents. This should include engagement with schools and colleges, pathways to higher skilled occupations and the up skilling and re skilling of workers in order to sustain employment at each stage of the development.

7. EAOW will work with the relevant planning authority to develop a delivery plan for skills in accordance with these principles.

Appendix 1

Letter of Intent with regard to Skills

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Date: July 2013
Cc: Nick Ward, Bob Chamberlain, Lucy Robinson

Mr John Pitchford
Spatial Planning and Sub Regional Partnership Manager
Suffolk County Council
Endeavour House
8 Russell Road
Suffolk
IP1 2BX

Dear John

Following East Anglia Offshore Wind's ("EAOW") engagement with Suffolk County Council and the district authorities affected by the proposed onshore cable route, it has become clear that all parties consider a strategy to develop skills in the area to be beneficial to both the region and the offshore wind sector. EAOW is therefore developing such a strategy based on the success, knowledge and experience of both parent companies.

We understand that Suffolk County Council is seeking assurances that this skills strategy will be responsive to the needs of the region and is forthcoming. The current envisaged process for developing the strategy is outlined below.

Action	Date
EAOW awards contract for development of a Skills Strategy	Completed November 2012
Skills strategy developed and recommendations made to EAOW	Completed April 2013
Finalisation of strategy – approval by EAOW Board and Parent Companies	Summer 2013
Delivery plan engagement with local authorities for input and refinement	Autumn 2013
Delivery plan finalised and agreed	2014
Implementation of Skills strategy delivery plan (aligned with project final investment decision)	2015
Construction Commencement East Anglia ONE	2016

Since being awarded the right to develop the East Anglia Zone there has been significant effort in building good working relationships with regional and local Higher Education (HE) and Further Education (FE) institutions, skills providers and organisations. These include University Campus Suffolk (UCS), University of East Anglia (UEA) UEA, Norfolk University Technical College (UTC), Lowestoft College, Great Yarmouth College, Norwich City College and Colchester Institute the East of England Energy Group (EEEGR) and its core Skills for Energy Programme. Working with The Crown

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Estate, EAOW has also carried out a Schools and Colleges Engagement Programme raising awareness in Norfolk, Suffolk and Essex of the employment opportunities in offshore wind. In Suffolk the schools that have been visited include: East Point Academy; Pakefield High, Benjamin Britten and Denes High in Lowestoft; Chantry in Ipswich; and, Felixstowe Academy.

The Schools and Colleges Programme, combined with the scoping visits of EAOW Directors to skills institutions and organisations, has provided an invaluable understanding of the existing skills and learning offers in the region as well as current capabilities and future initiatives. Through meetings with the Portfolio Holders for Skills and the officers in Norfolk, Suffolk and Essex, a clear understanding has been gained of the aspirations of the local authorities and in particular the intention of the County Councils to work together to support skills development across the three counties.

Our activities to date in engaging specifically for the benefit of East Anglia are listed in Appendix 1: Summary of Consultee Skills Engagements.

Skills Strategy

Both parent companies, ScottishPower and Vattenfall already actively lead and support a significant range of skills programmes (these are detailed in the attached Appendix 2: Parent Company Programmes). This provides evidence of our track record in delivering successful skills agendas and it is our intention to build on this success for East Anglia.

In 2012, EAOW commissioned the services of Suffolk-based consultancy Oakmere Solutions to support the development of an EAOW Skills Strategy and a Delivery Plan. The principles established in the Skills Strategy and adopted by the Joint Venture parents of EAOW are:

- To ensure the necessary balance of demand for, and supply of, professional and vocational skills to support the delivery of East Anglia ONE and to leave a legacy;
- To promote employment and re-skilling opportunities in the communities most closely associated with the development of East Anglia ONE;
- To utilise existing parent company skills programmes where and when possible and appropriate;
- To make best use of existing local and national education and skills infrastructures and add value to these where appropriate

Delivery Plan

EAOW have retained the services of Oakmere Solutions to examine the development of a Delivery Plan over the course of 2013/14. Building on the scoping work of EAOW Directors' visits Oakmere Solutions will take further counsel from key stakeholders including discussions with the local authorities. The aims of any Delivery Plan will be to address employability needs and enhance the current skills infrastructure.

The Norfolk, Suffolk and Essex County Council Skills MOU, supported by EEEGr, aims to raise awareness of the energy sector opportunities, to align skills provision and industry need and to develop apprenticeship programmes. The ambition of future discussions will be to identify areas of mutual interest with the Skills MoU Partners where co-operation will maximise combined leverage and provide shared support of programmes.

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The Delivery Plan would become effective post the Final Investment Decision (FID). Meanwhile EAOW would consider requests, on a case by case basis, to provide comment on bids to access public sector energy skills funding by the Skills MoU partners where such bids require the support of the private sector but this expressly excludes financial assistance or future match funding and ensuring compliance with all relevant legislative and commercial obligations or restrictions.

I trust that this letter will provide assurances that EAOW is progressing towards a Skills Delivery Plan that will involve cooperation with local authorities.

Yours sincerely

Helen Thompson

Senior Project Manager

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Appendix 1 : Summary of Consultees	Skills Engagements		
Analysis: January 2013			
Date of engagement	**Institution/Organisation**	**People**	**Key points**
Nov-11, Dec-11, Mar-12	Suffolk County Council	Judith Mobbs	LA role in Schools and FE College skills agenda, EPISCentre, LA Skills MoU
Nov-11	Suffolk County Council	Kath Ridealgh	Schools Engagement, World of Work Days, 14-19 Vocational Curriculum
Aug-12	Suffolk County Council	Kevin Rodger	Skills
Multiple	Suffolk County Council	Cllr Judy Terry	Skills development, linking with business, Suffolk Skills Board, Raising the Bar, UCS and Lowestoft College etc
Dec-11	Education Business Partnership	Angela Edwards	STEM Ambassador Programme
Jun-11, Dec-11	Essex County Council	Helen Russell, Louise Aitken	Harwich Port Initiative
Jun-12	Essex County Council	Peter Cook	Essex Apprenticeship Scheme
Multiple	Essex County Council	Cllr Kevin Bentley	Skills development, Apprenticeships, Essex University, EPISCentre, etc
Dec-11	Colchester Institute	Gary Horne, Adam Ward, Kiran Nanda	Introduction to curriculum, Harwich Port Initiative
Nov 11, Dec 12	Norfolk County Council	David Dukes	Hethel Engineering Centre
Multiple	Norfolk County Council	Fiona MacDiarmid	LA Skills MoU / Shaping Norfolk's Future (Event)
Multiple	Norfolk County Council	Cllr Ann Steward	Skills development, linking with business, EPISCentre, GY College Hethel Engineering
Oct-11	Norfolk County Council	Cllr Alison Thomas	Skills development
Multiple	Skills for Energy	Celia Anderson	Energy Skills Foundation Programme, Military links, EPISCentre, Degree Programme
Multiple	Lowestoft FE College	Simon Summer, Ian Pease, Ferlin Quantrill,	Introduction to curriculum. Development plans, Renewable UK accreditation
Sep-12	Great Yarmouth FE College	Penny Wycherley, Gary Jefferson	Curriculum Development
Multiple	UEA	Lawrence Coates, Dr Nick Goodwin	Curriculum Development

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May-12	UCS	Prof Mike Saks,	Introduction to Curriculum
Multiple	Norwich City College	Richard Jarrald	Development of University Technical College
Jun-12	University of Essex	Prof Eng Teck, Ville Karhussaari	Curriculum Development
Oct-12	Suffolk Chambers of Commerce	John Dugmore, Ian Dunnett, Dr Peter Funnell	General skills
Oct-12	Norfolk Chambers of Commerce	Caroline Rees; Caroline Williams	General skills
Multiple	EDF	Tom McGarry	Skills collaboration between EDF and EAOW
Multiple	BIS	Andy Dawber	General skills
Multiple	New Anglia LEP	Chris Starkie	General skills
Multiple	Waveney District Council	Cllr Bruce Provan; Cheryl Stockwell; Cheryl Willis	Skills event @ Pakefield
Multiple	Great Yarmouth Borough Council	Cllr Graham Plant, MD Richard Packham	Skills development
Multiple	Tendring District Council	CE Ian Davidson, Martyn Knappet, Sally Looker	Harwich Port Initiative, Skills development
Multiple	Enterprise Lowestoft	Hazel Johnson, James Reeder, Cheryl Willis	U-explore online tool
Nov-11, Nov-12	The Suffolk Education Business Partnership	Jenni Carberry	Energy ambassador scheme in conjunction with EEEGR
Mar-12	The Mason Trust	Yvonne Mason	An educational trust programme
Feb-13	Nexus Engineering Training and Resources	Keith Loveys	Engineering skills provider also offering specialist equipment and expertise

Appendix 2	Current Parent Company Programmes
Talent Group	ScottishPower - UK
Age 15-16 (S3 – S5)	**Skills For Work** – Glasgow – aim is to gain a skills for work qualification in engineering over 1 or 2 years dependant on the starting level of the student. SP enhance the college qualification by arranging site visits and delivering SP networks appreciation, jointing and overhead lines training.
Age 16-18	**Career Academy UK** – A UK based programme which will aim to select pupils with Engineering aspirations. Giving pupils taster sessions in Engineering activities and 4 weeks paid summer work. Also supporting with guru lectures etc. Partnership with Career Academy UK &Glasgow Council in the North, Fazakerley Engineering Specialist School in the South
Age 16-19	**Power Skills Programme** – Glasgow – Partnership between SP, Scottish Government and PDP. 12 young people who have underachieved through traditional routes and are at a crossroads in terms of future direction in life were selected to take part in an engineering focused programme . Working towards a NC in Engineering Craft Skills at Cardonald College over 6 months, to allow for potential progression to our Engineering Foundation Programme.
Age 16-18	**Engineering Foundation Programme** - talent feed for Apprentice Programme. 3 locations - Glasgow, North West England, Edinburgh.14 students sponsored on each programme. Gain an Electrical Engineering Qualification over 1 year – level 2. SP deliver overhead lines, cable jointing, basic hand skills, fitting and first aid training
Age 16+	**Apprentice Programme** - UK wide. Candidates work towards achieving industry recognised City & Guilds and NVQ qualification in Engineering over 3 years – level 2
Age 20+	**UK Engineering Graduate Programme** - UK Wide 2 year programme. Provides MEng/BEng Honours graduates with on the job experience, a variety of work placements and technical/behavioural training as they work towards Chartered Engineer Status
Age 20+	**UK Non Engineering Graduate Programme** - UK Wide 2 year programme. Provides Quantity Surveyor, Customer Service, Commercial, Finance & Economics graduates with on the job experience and technical/behavioural training
Age 20+	**International Graduate Programme** - UK/Spain - 2 year programme. Provides MSc/MEng/BEng Honours graduates with the opportunity to work on an oversees placement and gain on the job technical training as they work towards Chartered Engineer Status.
	In Development – ScottishPower - UK Pilot Programmes
Age 16+	**Talent Bank** - UK wide pilot working in partnership with NSAP and our contractor population to train additional apprentices via a talent bank route. On head count in business but trained and developed externally joining the company in 2014 after a 2 year programme with talent bank. Candidates work towards achieving Industry recognised City & Guilds and NVQ qualification in Engineering. Pilot group for EN will be 20 10 x North and 10 x South.

Age 17+	**Higher Skills** – Pilot programme for 10 school leavers with A levels or Highers. 2-3 year programme to develop/train to operational engineering level. HNC in Power and competence based qualification gained if level 4. Foundation degree level of qualification gained if level 5.
Supply chain	**Dumfries College** – Pilot – to demonstrate our commitment to our contractors to begin to address the future skills shortage. Provision of the required materials and equipment to develop an OHL technical area within the College complex. Will also provide technical trainer experience to train the College trainers.
Age 15-17	**Career Academy UK work placements** – support students to embark on industry work placements. Guru lectures supported by employed former graduates. Celebration event delivered where pupils visit at Whitelee.
Age 14-16	**Engineering Scholarship Programme** - provide site visits for school pupils showing an interest in Engineering
	Vattenfall - UK
Age 16+	**Sponsored Apprenticeships** – Four sponsored apprenticeships at Pen y Cymoedd Wind Farm, Wales. Fully funded three-year training programme whilst working for a local firm. Gain a wind turbine technician qualification. Further schemes planned for other UK sites.
Ages 5 - 11	**Local Primary School Engagement** – Presentations on the benefits of wind power and renewable energy, with Q&A sessions, for Primary School children from areas local to UK Vattenfall projects.
	Vattenfall – International
Ages 20+	**International Trainee Programme** – 15 to 20 graduates accepted for a 1 year placement in different Vattenfall business areas. Placement includes time spent working in the 'home organisation', seminars, and two short term assignments in other parts of the organisation, one of which must be abroad.
	Vattenfall – Sweden
Age 18+	**University Career fairs** – annual participation in university careers fairs all over Sweden.
Age 14+	**Vattenfall University Project** – Cooperation agreements with Swedish secondary schools, polytechnics, colleges, and universities to increase the interest of young people and to enhance the skills of future engineers. Activities include visits to Vattenfall facilities.
Age 18+	**Thesis Projects** – Opportunities for students to complete their degree project work with Vattenfall either through advertised placements or individual proposals.
Age 16+	**Summer Job Placements** – six week summer holiday placements in Vattenfall power facilities for high school and university students
Aged 13	**Girls and Technology Programme** – An annual three day programme for up to 48

	female students to encourage girls into the energy sector. Takes place at a Vattenfall power facility and includes experiments, games, activities and lectures.
	Vattenfall – Germany
Age 18+	**University Career fairs** – annual participation in university careers fairs all over Germany.
Age 18+	**Internships** – 3 – 6 months duration. During internships, participants have opportunity to partake in visits, excursions, training opportunities, thesis work and exhibitions
Age 18+	**Masters Scholarship Programme** – includes a monthly stipend for participants, seminars, tours, exhibitions and support with the participants subsequent Master's Thesis.
Age 18+	**Thesis Projects** – Help to formulate participant's thesis topic and individual support from the company to help participants complete their work.
Age 18+	**Student Placements** – For University or College students. Placements during term time (20 hours per week) and holidays (37 hour per week). Chance to take over projects and support the team in different divisions within Vattenfall.

Annex 11 Definitions

AC	Alternating Current
BIS	Department of Business, Innovation & Skills
CAPEX	Capital Expenditure
CfD	Contract for Difference
DECC	Department of Energy and Climate Change
EA	East Anglia
EA1	East Anglia ONE Limited
EEEGR	East of England Energy Group
EOWDC	European Offshore Wind Deployment Centre
EPCI	Engineer, Procure, Construct and Install
EWEA	European Wind Energy Association
FID	Final Investment Decision
FTE	Full Time Equivalent
GVA	Gross Value Added
GW	Gigawatt
HVDC	High Voltage Direct Current
IEC	Iberdrola Engineering and Construction
IPR	Intellectual Property Rights
ITT	Invitation To Tender
kV	Kilovolt
LCOE	Levelised Cost of Energy
LFAC	Low Frequency Alternating Current
MHV	Mitsibushi Heavy Industries - Vestas
MOU	Memorandum of Understanding
MW	Megawatt
NIA	Network Innovation Allowance
NVQ	National Vocational Qualification
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
OPEX	Operating Expenditure
ORE Catapult	TSB's Offshore Renewable Energy Catapult
OREEF	Offshre Renewable Energy Emergency Forum
ORI	Offshore Renewables Institute
ORJIP	Offshore Renewables Joint Industry Projects
OWA	Offshore Wind Accelerator
OWIC	Offshore Wind Industry Council
OWPB	Offshore Wind Programme Board
PQQ	Pre-Qualification Questionnaire
R&D	Research and Development
RTN	Renewables Training Network
SPEN	Scottish Power Energy Networks
SPR	ScottishPower Renewables (UK) Limited
SSE	Scottish and Southern Energy
STEM	Science, Technology, Engineering and Mathematics
TIC	The University of Strathclyde's Low Carbon and Energy Technology Innovation Centre
TSB	Technology Strategy Board
UCS	University Campus Suffolk
UEA	University of East Anglia
UK	United Kingdom of Great Britain and Northern Ireland
UKTI	UK Trade and Investment
UTC	Norfolk Univeristy Technical College
Vattenfall	Vattenfall Wind Power Limited
W&T	Wave and Tidal
WoDS	West of Duddon Sands
WTG	Wind Turbine Generator