Dogger Bank Wind Farms

DB3 Supply Chain Plan

DOGGER BANK WIND FARMS BY sse equinor

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DB3 Supply Chain Plan

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Project Details

Project Name	Doggerbank Offshore Wind Farm Project 3 Projco Ltd (DB3)	Project size (in MW installed capacity)	A maximum of 1200 MW
Project Commissioning Date	[redacted]	Project location	DB3 is approximately 196 kilometres from shore, off the coast of the North-East of England.
Ownership Structure	50/50 Joint Venture between Equinor and SSE.		
Maturity of project	The Crown Estate Agreements for Lease of the wind farm site and the cable corridor were executed on 6 August 2015. A Development Consent Order (DCO), including deemed marine licences, was made on 4 August 2015. A Grid Connection Agreement for 1000 MW was signed in October 2011, with a grid connection date of April 2023 for 500 MW and April 2024 for an additional 500 MW. FID is anticipated in September 2020. [redacted]		

1. Introduction

1.1 Doggerbank Offshore Wind Farm Project 3 (DB3) is a Crown Estate round 3 licence offshore wind project located in the North Sea c.196 kilometres from shore at its closest point. The site is 560 kilometres[2] in area and the DCO was granted on 4 August 2015. DB3 will comprise up to 200 wind turbine generators (WTGs) with an installed capacity of up to 1.2 gigawatts (GW) (see map at **Annex 1**). The site was formerly known as Teesside A.

1.2 The Dogger Bank (DB) Wind Farms were consented by Forewind (a consortium of SSE, Statkraft, Innogy and Statoil (now Equinor)). In 2017, Statkraft sold its shares to SSE and Equinor, and Innogy exited with 100% stake in the Teesside B project (now called Sofia Offshore Wind Farm). The DB1, DB2 and DB3 projects are being developed by the SSE and Equinor joint venture (the DB JV).

1.3 The DB projects are an important strategic opportunity for both the DB shareholders and the UK. We will play a pivotal role in realising the UK Industrial Strategy goals for offshore wind in the next decade and beyond. With up to 3.6 GW of clean energy, the DB area will be the bedrock of offshore wind in the North-East of England. We estimate that £3.7 billion will be spent in the UK during construction and a further £3.9 billion during the operations and maintenance (O&M) phase[1]. The projects are predicted to contribute £6 billion[2] to UK GDP and to support 107,700 UK job years between 2017 and 2048. The High Level DB3 Project Gannt Chart is at Figure 1, and the Procurement Milestone Plan is at **Annex 2**.

1.4 SSE is a UK FTSE 100 company and leading generator of renewable electricity in the UK and Ireland and, as of 01 January 2019, has 3,955 megawatts (MW) of renewable generation capacity. It invests in modern infrastructure, supporting and creating sustainable jobs, with a long-term strategy to develop, own and operate assets. It has reduced the carbon intensity of the electricity it generates by 50% since 2006 and aims for a further 50% reduction between 2018 and 2030. It is expected that approximately £1.3 billion[3] of SSE's capital and investment expenditure over the next 5 years will be in UK renewables which will support the growth of the UK offshore wind supply chain.

1.5 In Financial Year (FY) 2017/18 SSE paid £484.1 million in UK tax and has been an accredited Fair Tax Mark company since 2014. It has c.21,000 direct employees and last year contributed £8.6 billion to UK GDP[4], and supported supply chains with a total procurement expenditure of c.£2.9 billion[i]. It liaises directly with suppliers to ensure its values are upheld throughout its supply chain. Material issues include: fair expectation in the delivery of projects; the management and mitigation of health and safety (H&S) risks on sites; the delivery of economic opportunities to local supply chains; and, ensuring that social and environmental impacts, such as modern slavery, Living Wage and resource use, are managed and mitigated.

[1] PWC analysis June 2017
[2] In 2017 prices and in NPV. GDP: measured in terms of Gross Value Added (GVA)
[3] Figure excludes bank financed offshore wind
[4] FY17/18 PWC analysis

1.6 Equinor New Energy Ltd (ENEL) is a subsidiary of Equinor ASA (Equinor). Equinor is a Norway based energy company with operations in more than 30 countries. In addition to producing oil and gas, the company is also developing large-scale offshore wind. On May 15, 2018, it changed its name from Statoil to Equinor. Equinor is a values-based company, and equality describes how it wants to approach people and the societies where it operates. Equinor's values are: Open, Collaborative, Courageous and Caring.

1.7 Equinor intends to build on its significant offshore experience in harsh environments and rough waters, applying its expertise to new areas such as offshore wind. It is already an innovator in offshore wind and its ambition is to grow. It believes that energy must be secure, sustainable and competitive. Equinor intends to invest around NOK 100 billion (approximately £9.5 billion) in new renewable energy, including offshore wind, in the next decade.

1.8 Equinor's offshore wind portfolio has the capacity to provide over 1 million homes with renewable energy. It includes Arkona offshore wind farm (OWF) in Germany, Sheringham Shoal Offshore Wind Farm (SSOWF), and Dudgeon Offshore Wind Farm (DOWF). In October 2017 it started producing electricity from the world's first floating wind farm; Hywind Scotland[ii]. It is demonstrating the feasibility of future commercial floating wind farms that could be significantly larger than the 30 MW pilot. Equinor is now exploring the potential to supply existing oil and gas platforms at the Gullfaks and Snorre fields with power from a floating wind farm. This potential project, known as Hywind Tampen, would build on the experience from Hywind Scotland and would have a combined capacity of 88 MW. Equinor was also the first developer to install battery storage for an OWF. The Batwind[iii] project is a 1 MWh battery-based storage pilot, installed at the Hywind Scotland onshore substation.

1.9 SSE and Equinor have diverse experience of operating a combined 1253 MWs[5] of installed offshore wind capacity in the UK, with a further 588 MW[6] currently under construction at Beatrice Offshore Windfarm Ltd (BOWL)[iv]. The shareholders have extensive experience of working in JVs and delivering complex energy projects cost-effectively through utilisation of innovation and promotion of effective competition.

1.10 Text in [redacted] is commercially sensitive and is to be redacted until one year after DB3 has signed a CfD contract. Text in [redacted] is commercially sensitive and is to be redacted until the last of the DB JV projects have signed CfD contracts. Text in [redacted] is extremely commercially sensitive and is to be redacted in perpetuity. A Glossary of terms is at **Annex 14**.

[5] Equinor has: 40% share of Scira Offshore Energy Ltd, the owner of SSOWF which is 317 MW; 35% share of DOWF which is 402 MW; and, 75% of the 30 MW Hywind Scotland. SSE has a 25.1% share of Walney which is 367 MW, and a 50% share of Greater Gabbard Offshore Winds Limited's (GGOWL) 504 MWs.

[6] BOWL in the Moray Firth is expected to be fully operational in 2019. SSE has 40% stake in the 588 MW project and will operate the project.

Figure 1. [redacted]

2. Overall Project Procurement Strategy

2.1 Our overriding commercial driver is to deliver the lowest Levelised Cost of Energy (LCoE), ensuring value for money for UK consumers. **We will endeavour to use UK manufacturing wherever quality, safety, programme and cost-effectiveness can be maintained.**

2.2 Our procurement strategy is a multi-contract approach with [redacted] main contract packages. The Procurement Milestone Plan can be found at **Annex 2**. Each of the contracted parties will deliver different elements of the design, supply, installation, commissioning and operation of the project (see **Annex 3**). The interfaces and risks between the packages will be managed by the project team. Based on our previous experience, we believe this strategy offers the best opportunity to deliver against the Supply Chain requirements.

2.3 Multi-contracting will allow us to engage with the supply chain to define Employer's Requirements for individual work packages. Such engagement will enable us to identify the most cost-effective allocation of risk, enabling us to elect to include more or fewer Engineering, Procurement and Construction (EPC) elements in contracts. More suppliers will be able to compete for packages; thereby, increasing the opportunities for new entrants. It is anticipated that a total of 40-50 suppliers will be invited to tender across all packages.

2.4 Market risk premiums will be significantly reduced using a multi-contracting strategy when compared to one overall EPC strategy. Based on previous experience, we expect this to result in an overall cost reduction of [redacted] compared to an EPC strategy.

2.5 Each Tier 1 supplier (Tier 1s) will be required to submit a supply chain plan. **Where a contractor commits to UK content in its bid, and where a UK provider exists in the market, we will include terms to ensure that the contractor is bound to deliver on its commitment. This will ensure our suppliers continue to support the development of sustainable supply chains**. Tier 1s will be required to explain how they offer opportunities to new entrants and what steps they take to engage new suppliers. They will be required to hold their own supply chain events and attend those organised by the DB JV.

2.6 Multi-contracting requires greater internal project resource and interface management experience, and this will create job opportunities in the construction phase. We have employed an Interface Manager to work with the project team and the supply chain to assess the risks related to each work package, so all parties are clear on risk apportionment and management. Early engagement with banks and lenders' advisors has commenced to enable the project to achieve the best terms in the market.

2.7 Early supplier engagement has given us a robust understanding of the supply chain capacity and of potential bottlenecks. We have had time to evaluate potential new entrants to the market and to assess new innovations. We are open to making pre-commitments to secure capacity in key areas e.g. vessels and cables. We will continue to review opportunities for synergies (particularly if more

than one DB project achieves a CfD), which will be promoted through Invitations to Tender (ITTs) where it will be made clear that there are opportunities to be awarded contracts for more than one DB project.

2.8 During the O&M phase there will also be a multi-contracting strategy:

a) The Wind Turbine Supplier (WTS) will be granted a service warranty agreement (SWA) for between 5 and 15 years. The SWA provider will be responsible for service execution, trouble-shooting, retrofits, main component exchange, remote diagnostics, and operation of the WTGs. The Operator has the right to employ up to 50% of the technicians (to be trained by and seconded to the WTS for the duration of the SWA). [redacted]

b) The Operator will be responsible for logistics and will engage (where they are used) the Service Operation Vessel (SOV), the vessel, the helicopter and helicopter platform, the supply vessel, and, the onshore O&M base. The SOV and helicopter platform will be charter party contracts. The vessel operator will also be responsible for provision of crew, hotel, and catering functions. The O&M base will be on leased land and will be located at a local port in the North-East of England;

c) The transmission systems (offshore substation, export cables and onshore substation) will be subject to a regulated sale to an Offshore Transmission Owner (OFTO). Until the sale to the OFTO, the Operator will be responsible for the O&M and will, most likely, enter into a maintenance agreement with UK-based service provider; and,

d) The Operator will be responsible for a several contracts during the O&M phase which will be procured mainly from the local supply chain near to the O&M base. Examples of this from JV partner projects are provided in the following sections.

3. Competition Targets

3.1. **Competition Commitments**

3.1.1. DB3 commits to the following actions to deliver competition in the UK OWF supply chain:

- We will create a UK-based role for the DB JV of "Supply Chain Interface Manager", responsible for liaison with potential new entrants and growth of the UK supply chain.
- We will implement a multi-contract procurement strategy to facilitate the expansion of the supply chain and ensure the widest pool of potential suppliers.
- We will be open to negotiating payment terms instead of imposing our default standard terms.
- We will challenge Tier 1s to source secondary steel from the UK.
- We will establish an online procurement portal to improve opportunities for UK companies to contract with DB3 and its contractors.
- We will include contractual terms to ensure that Tier 1s are bound where they have committed to UK content in their bid and a UK supplier exists in the market (see para 2.5).
- [redacted]
- We will support [redacted] in their efforts to enter the offshore wind market, to encourage greater competition and growth of the UK supply chain.
- We will work with NOF Energy and the North-East of England Cluster to bring value to future O&M operations with a focus on utilising innovation and technology.
- We will be open to discussing synergies with other UK OWFs post-CfD award.
- We will establish an O&M base in the North-East of England for the DB project(s).

3.1.2. Additional commitments and actions are captured through this section as bold text.

3.2. Encouraging broader supply chains and supporting new entrants

3.2.1. When Greater Gabbard Offshore Winds Ltd (GGOWL)[v], a 50/50 JV between SSE and Innogy, was in construction it was the largest UK OWF, it was situated in the deepest water of any UK OWF and was the farthest OWF from shore. The OWF supply chain was embryonic so it used the vast oil and gas experience in the Lowestoft region and introduced multiple new suppliers to the offshore wind industry.

3.2.2. SSOWF produced a Supplier's Directory, containing contact details for more than 130 local businesses, to enable local suppliers to contact the main contractors to promote their products and

services. In the last 12 months SSOWF has 224 active contracts; 207 contracts contain UK elements, and 68 contracts are entirely from East Anglia.

3.2.3. The newly created Supply Chain Interface Manger position will coordinate between the JV, Tier 1 suppliers and potential new entrants to facilitate the assessment of and potential use of new suppliers and/or technology. They will be empowered to challenge the JV and the Tier 1s to encourage expansion of the UK supply chain.

3.2.4. **We will apply best practice from Equinor and SSE to continue to encourage a broader supply chain and support new entrants. This will be in combination with improving awareness of commercial opportunities as described in paras 3.5.3 and 3.5.4 below.**

3.3. Identification and removal of barriers to entry

3.3.1. SSOWF, DOWF and GGOWL have regular meetings with suppliers, including potential new entrants, to identify and resolve barriers to entry. GGOWL advises local companies how to meet the Achilles qualification criteria and reimburses B1 registration fees. SSOWF includes local content question in Requests for Information (RfIs) and provides new suppliers the details of companies that can provide offshore training to meet pre-qualification criteria.

3.3.1. Equinor used Applus Velosi in its oil and gas business and supported its entry to the offshore wind market. Despite the risks of using a new supplier in offshore wind, SSOWF awarded Applus Velosi its first offshore wind contract for the full scope of offshore statutory inspections. This increased competition and has enabled Applus Velosi to establish a UK base for offshore wind support.

3.3.2. Barriers to entry are often accreditation related so **we will work closely with each Tier 1 supplier to help them gain Achilles B2 verification**. Subcontractors do not require Achilles B2 verification as Tier 1s will follow their own processes for procurement of their supply chain.

3.4. Sharing of best practice and lessons learnt

3.4.1. Our team consists of staff from both organisations with previous OWF experience in all stages of the project lifecycle. We have skilled staff from onshore renewables and oil and gas that bring onshore substation, planning, construction, and marine operations experience.

3.4.2. We have merged the Equinor and SSE supply chains, creating a greater range of potential suppliers when compared to the shareholders' earlier OWFs. All suppliers will demonstrate the key lessons learnt they intend to apply to DB3 through their tender submissions.

3.4.3. **We will collaborate with suppliers to share best practice and lessons learnt to identify cost saving and value improvement opportunities.** We have held lessons learnt workshops with staff from other shareholder OWFs (see **Annex 4**), and **lessons learnt will also form part of the agenda for each Tier 1 supplier kick-off meeting.**

3.5. Improving awareness of commercial opportunities

3.5.1. DOWF has web pages for supplier registration and information on Equinor's procurement requirements. The BOWL website includes details of the supply chain opportunities available during

the O&M phase, an email address to those companies who wish to offer services, and a link to the Open4Business (O4B) web pages.

3.5.2. O4B is an SSE initiative encompassing an online procurement portal to help Highlands & Islands companies do business with SSE and its principal contractors (see **Annexes 5 and 6**). Before the London Olympics, the Olympic Delivery Agency developed the CompeteFor website to promote business opportunities around the Games. The Highlands & Islands O4B web portal is based on the same model. It has aided the development of strong ties between SMEs and large multi-national companies in the Highlands & Islands. The highlights include:

a) Improved communications within the supplier and buyer communities;

b) Over £174 million of UK contracts awarded since June 2012;

c) Local and SME suppliers provided with visibility of business opportunities and registered local suppliers alerted when relevant local opportunities arise;

d) Leveraging of the wider SSE supply chain to provide opportunities with SSE supply partners and with their supply chain partners to maximise local opportunities;

e) Local businesses & SMEs register for free with no charges to advertise or respond; and,

f) O4B was the winner of the 2013 Scottish Council for Development and Industry Excellence in Business Service and Engagement Award, and the 2014 Green Energy Award for Contribution to Supply Chain Development.

3.5.3. **Our website will have a registration page for suppliers and we will use the supplier database compiled by Forewind. We will set up a procurement portal and terms in our contracts will require Tier 1 suppliers to advertise opportunities on the portal.**

3.5.4. We updated the supply chain at a “Meet the Buyer Day” in May 2018 where suppliers had face-to-face meetings with the project team. The event was oversubscribed (225 companies attended with 156 face-to-face meetings), and we are considering how to target further events.

3.6. **WTGs**

3.7. Encouraging broader supply chains and supporting new entrants

3.7.1. Equinor was instrumental in persuading Siemens to establish itself in Hull and DOWF was the first OWF to use the new Hull Siemens base for assembly and load out.

3.7.2. BOWL ensured its EPC contractors maximised local opportunities and broadened the supply chain. Siemens Gamesa contracted with Global Energy Group to use Nigg Energy Park and the Port of Nigg for construction and marshalling works, which created up to 100 jobs. It also appointed Windhoist Ltd, a company based in Scotland, to undertake a 10-month wind turbine pre-assembly contract which supported 40 local jobs. Previously, Windhoist had only worked in onshore wind, and BOWL was its first offshore wind contract worth over £2 million.

3.7.3. Wind Towers (WTL) was a JV established between SSE, Marsh Wind Technology Ltd (MWT), and Highlands and Islands Enterprise (HIE). WTL rescued the wind turbine tower manufacturing and assembly plant at Machrihanish from administration. SSE sourced from it towers for several of its onshore wind farms. SSE sold its shares to CS Wind, a South Korean company, in April 2016, enabling the facility to expand into offshore wind tower production. The plant produced its first offshore tower in September 2016, and BOWL was supplied with 12 of the earliest offshore wind towers from the facility.

3.7.4. There are limited opportunities for new WTSs. [redacted] Since March 2017 we have been engaged with the pre-qualified WTSs to understand current and future technology development plans, available capacity, collaboration models and value improvement opportunities focused on reducing the LCoE.

3.7.5. **We will promote the use of UK components within the WTG through our continued engagement with the pre-qualified WTSs**. We are aware of the likely limited availability of bearings and castings to maintain pace with WTG construction. **We will help to identify and support new entrant companies seeking to expand into areas where component availability is forecast to become stretched** (also see para 3.28.2).

3.8. Sharing of best practice and lessons learnt

3.8.1. There will be early engagement and collaboration with the preferred supplier (PS) to share best practice and lessons learnt from our offshore wind portfolios. **The pre-qualified WTSs were invited to 1:1 best practice sessions on installation and commissioning**. We spent 2 days [redacted] assessing optimisation options and evaluating synergies.

3.9. **Foundations**

3.10. Encouraging broader supply chains and supporting new entrants

3.10.1. On the BOWL project, local company BiFab was awarded 2 multi-million-pound contracts to provide 26 wind turbine jackets, 2 offshore transformer module (OTM) jackets and 8 piles. Three jacket fabrication companies were utilised: BiFab, Smulders and Bladt, which spread the manufacturing risk. This allowed one fabricator to back-fill if another was unable to meet the required output rate. Inward investment was encouraged (Smulders took over a yard in Newcastle for final assembly) and more companies were able to participate in and remain in the jacket foundation market, thus ensuring greater competition for later OWFs.

3.10.2. DB3 has engaged with several foundation contractors. There will be one contract for design (Monopile (MP) and Transition Piece (TP)) and 1 or more contractors for fabrication (MP and TP).

The engineering design work is specialist and the list of potential suppliers only includes [redacted] **Fabricators will be asked about their experience of foundation design companies as a route to identifying new entrants for inclusion in the design ITT.**

3.11. Identification and removal of barriers to entry

3.11.1. [redacted] We expect it to be compliant and to qualify to be included in the full ITT for fabrication of MPs, TPs and supply of secondary steel. If it is not selected as a Tier 1 supplier, **we will facilitate opportunities for it to act as a Tier 2 supplier.** [redacted] to meet delivery timescales and mitigate the risk of delays.

3.11.2. **We will challenge the Tier 1s on the source of secondary steel**, encouraging the use of UK steel where quality, programme, and cost-effectiveness can be maintained.

3.12. Sharing of best practice and lessons learnt

3.12.1. Each of the potential suppliers has similar OWF experience so each tender will be assessed on: proposals for efficient manufacturing; production timescale improvement; encouragement of opportunities for UK suppliers; and, facilitation of the interface of new WTG technologies.

3.13. **HVDC Equipment Design, Fabrication and Supply**

3.14. Encouraging broader supply chains and encouraging new entrants

3.14.1. The market for supply of offshore HVDC equipment is dominated by ABB and Siemens due to, in part, the infancy of HVDC use on OWFs. To encourage a broader supply chain, increase competition, and reduce cost for this equipment category, we initiated 2 actions:

[redacted]

3.15. Identification and removal of barriers to entry for new suppliers

3.15.1. [redacted]

3.15.2. Given the scale and complexity of the work package [redacted] equipment supply and overall engineering contract. [redacted]

[redacted]

3.16. Improving awareness of commercial opportunities

3.16.1. The DB projects will be a key facilitator of the growth of a UK HVDC supply chain; we will be the first UK sites to construct an offshore HVDC transmission system including HVDC Offshore Platforms. The complexity of technology, and limited number of capable suppliers, means that the pool of potential UK-based Tier 1s is limited; however, there will be opportunities for UK-based subcontractors and scope for their upskilling. **We have encouraged the HVDC consortiums to obtain bids for part of their scope from UK suppliers**.

3.17. Sharing of best practice and lessons learnt

3.17.1. [redacted] We will be able to exploit lessons learnt [redacted] is selected and experienced individuals who worked on this project are now working on DB3.

3.17.2. [redacted] Their main objective will be to deliver a fully integrated and functional offshore platform. The contracts will be managed, planned and executed in line with this principle, so that day-to-day execution will be [redacted] As experienced developers, we understand that we must monitor this interface closely to reduce risk and potential cost increase associated with such risk.

3.17.3. **We will insist on evidence and commitment from Tier 1 suppliers that they engage with HSE fora including G+, both within their supply chain and the wider industry. We will seek to audit/participate in such HSE fora and workshops.**

3.18. **Submarine Export Cable, 66 kV Inter-Array Cables & Onshore HVDC Cables**

3.19. Encouraging broader supply chains and supporting new entrants

3.19.1. For export cable production (onshore and offshore) and installation (offshore), the contracting strategy is closer to an EPC approach. Only 3 cable manufacturers can offer an EPC approach, so we elected to issue the ITT to both cable suppliers and qualified marine installers to allow bidders to price for a matrix of lots on the supply and/or installation scope, including the full EPC. We will select the best contractor(s) to deliver the full scope. **We allowed the widest pool of suppliers to bid for**

this work with 6 cable suppliers, only 3 of whom have installation vessels, and an additional 4 installation contractors included in the ITT (see also para 3.26.1)**.**

3.19.2. [redacted]; therefore, we endeavoured to support new entrants to the market to increase competition and reduce cost. [redacted]

3.20. Identification and removal of barriers to entry for new suppliers

3.20.1. At DOWF, VBMS selected JDR as the cable supplier. JDR was not fully qualified for the scope at contract award; however, DOWF worked with it during the engineering phase to qualify its cable fabrication joint and hence remove this barrier to its use on the project.

3.20.2. We have supported Carbon Trust led initiatives exploring 66 kV array cable solutions for OWFs to help reduce costs for large OWFs. We have collaborated with cable manufacturers (such as JDR) who were incentivised to develop, test and certify 66 kV submarine cables.

3.20.3. Landfall Horizontal Directional Drilling (HDD) is part of the submarine export cable scope. The potential Tier 1s for that package will inform us which subcontractor they intend to use or provide us a short-list of companies they will be tendering to. **UK companies have sufficient competence and capacity and will be used where they are competitive.**

3.21. **Onshore Construction**

3.22. Encouraging broader supply chains and supporting new entrants

3.22.1. BOWL is investing c.£20 million in the Wick Harbourfront. Bam Nutall is the principal contractor for the renovation of the 2 historic buildings which will become the O&M base. Wick-based GMR Henderson is the subcontractor for the demolition and preparatory works, local companies have provided cranage and fuel, and HRI Architects of Inverness has led the renovation design team. Redevelopment of the disused section of the inner harbour is also underway to provide berthing and infrastructure for up to 6 crew transfer vessels (CTVs). Around 75% of the 60+ people working on the O&M base at Wick are locals, and c.90 people will be employed at the O&M base in the longer-term.

3.22.2. We intend to appoint the onshore cable installation contractor from the UK supply chain. Each potential contractor will have proven experience of undertaking similar works and will be asked to demonstrate their methodology and new technological advancements in specific high-risk areas. The DB JV is utilising UK companies in many areas including onshore topographic survey, onshore ground investigation, and the onshore HVDC converter station site enabling works. In total, 76 contracts have been put in place to date with a value in excess of £7 million. A wide range of suppliers have been included in the ITTs and we have included local contractors.

3.23. **Offshore Construction/Marine Installation**

3.24. Encouraging broader supply chains and supporting new entrants

3.24.1. **DB3 will invite several suppliers to bid for the marine installation work.** We can accommodate new installation methods which may improve overall schedule, cost and risk.

3.24.2. We will need a variety of vessels for export cable installation, inter array cable installation, WTG installation, foundation installation, survey, etc. We have identified several UK-based contractors and **we are working with potential new entrants** [redacted] **to pre-qualify them to increase competition in this area**. [redacted] It is a potential new entrant to the offshore supply chain and is pursuing opportunities for transformer platforms and turbines. **We have made** [redacted] **aware of the opportunities at DB3 and encouraged it to participate in our tendering process for** [redacted] **DB3 has worked closely with** [redacted] **to assist it becoming a new entrant to the offshore wind market**. We have held meetings and [redacted] has produced studies demonstrating new and interesting concepts being developed for WTG, MP and TP marine installation. Through working with these potential new entrant companies, we hope to promote investment in UK facilities and growth of the UK supply chain.

3.24.3. A range of cable installation vessels have been developed or are under construction to undertake submarine export cable installation. The new vessels are being constructed in response to increased OWF distance from shore, and they have increased cable storage capacity enabling long export cables to be installed in bundles. **We have engaged with suppliers to ensure that the size of new vessels does not preclude participation in future work.**

3.25. Identification and removal of barriers to entry for new suppliers

3.25.1. The marshalling port(s) to be used for the blades, nacelles and towers will depend on the PS, the size of the project, and the size of the WTG. We will engage with the PS and the relevant port(s) to understand what infrastructure investment is needed and any opportunities to maximise local jobs and training. **We will promote UK ports as base for load-out of MPs, TPs, WTG blades, nacelles and/or towers.** We will assess any synergies to be exploited in terms of the construction of multiple DB OWFs and shared O&M facilities.

3.26. Sharing of best practice and lessons learnt

3.26.1. At DB3 resources on the team have worked previously on OWFs and/or HVDC cable installation for oil and gas platforms (para 3.17.1). **The contracting strategy for export and inter-array cables allows us to select a separate contractor for installation to ensure the availability of the right tools for the range of conditions we expect to see** (see also para 3.19.1). HDD at landfall is a

key interface point between offshore and onshore works so **we will use experienced in-house staff to ensure that we manage HDD interface risks.**

3.27. **O&M**

3.28. Encouraging broader supply chains and supporting new entrants

3.28.1. During the O&M phase BOWL will advertise for long-term frameworks and short-term contracts for the operational supply chain, the ongoing maintenance of the OWF, and logistical assets. The value of these contracts will range from £5,000 to £1 million+, with over 50 contracts being let in the next 12 months. All the contracts will be competitively tendered and assessed on price and quality. It is expected that local businesses will be commercially competitive based on their geographical location.

3.28.2. SSOWF identified that several WTG gear boxes needed replacing when it was no longer under the Original Equipment Manufacturer (OEM) warranty agreement with Siemens. It proactively supported growth of the supply chain when it sought alternative suppliers[vi]. It identified a Finnish company, Moventas, who was supplied with the same gearbox type as used in the SSOWF turbines. Moventas was able to reverse engineer the problem and develop technology to fix the issue. Moventas proved cheaper than the OEM and has now established a UK base. Similarly, SSOWF ran a project to determine whether local suppliers could refurbish damaged components. Damaged components were sent to various local companies to assess which companies had the required skills to fix them. Contracts are now in place with new entrant local contractors for the refurbishment of a variety of offshore WTG components.

3.28.3. **We will establish an O&M base in the North-East of England for the DB projects**. **We have visited local ports to discuss O&M requirements,** including: Blyth, Middlesbrough, Seaton, Sunderland and Hartlepool. In addition, **members of the DB JV Boards continue to play an active role in the establishment of UK clusters, including one in the North-East of England**. **We are open to discussing synergies with other North-Eastern OWFs post-CfD award.** The DB projects will be crucial to the development of the North-East cluster. We expect staff for onshore O&M support positions to come primarily from the North-East. Larger O&M service contracts will be sourced from a wider area, but minor contracts will be sourced more locally. The DB3 O&M activities are expected to directly employ 200 people (based on a 2 x SOV concept) roughly split 50% employed by the Operator and 50% by contractors.

3.28.4. We are considering whether to utilise helicopters to access the WTGs (see also para 4.32.2). We sent RfIs to all UK helicopter operators providing heli-hoisting services to the wind industry to invite them to support the development of the DB3 O&M strategy. **We met with the companies that responded to discuss specific project challenges and solutions.**

3.28.5. If we opt to use multiple SOVs instead of helicopters, the amount will be dependent on the number and size of the DB projects that are awarded a CfD. The SOVs will provide access and

accommodation facilities offshore and will port call at least weekly. Daughter craft, which will be launched and recovered from the SOVs, will be used as a secondary means of access.

3.29. Identification and removal of barriers to entry for new suppliers

3.29.1. GGOWL has engaged with a new company, Creadis UK Ltd, based in Lowestoft, which has been set up to provide services and advice for WTG technology installed in UK waters.

3.29.2. SSOWF assessed ports and included Wells-next-the-Sea despite the existing facilities not meeting the project requirements. It committed to improvement works at the harbour including dredging (ongoing) and the construction of a pontoon. SSOWF was the first, and to date only, OWF to undertake extensive works to allow a harbour to be used for an OWF.

3.29.3. **We will work with local authorities near the O&M base to map the potential suppliers** to ensure that we are aware of the skills in the local area. Given the limited OWF O&M activity in the North-East of England, most potential future suppliers will be new entrants, so **we will work with them to remove barriers to entry**. The exact requirements will be identified in the O&M phase, following the end of the SWA period.

3.30. Sharing of best practice and lessons learnt

3.30.1. Both GGOWL and SSOWF participate in the Siemens 3.6 MW Owners' Forum which has open forum discussions involving the sharing of O&M lessons learnt and actual observations. This enables industry best practice to be utilised to prioritise rectification and maintenance activity, which results in O&M cost savings and promotes greater competition in service provision. Equinor established an equivalent forum for the Siemens 6, 7 and 8 MW direct-drive turbines.

3.30.2. GGOWL employed innovation and applied engineering and best practice procedures to deviate from OEM recommended timescales and activities to save costs and unnecessary trips offshore. In calculating the "value" of the warranty it may be possible to deviate from recommended schedules earlier in the life of the equipment and demonstrate tangible savings without compromising asset integrity or safety.

3.30.3. **DB3 will continue to work with the shareholders' portfolios of OWFs to gather and apply O&M lessons learnt**. We will engage with the wider industry and **actively participate in industry forums to help develop the industry and we commit to working proactively with other operators and suppliers.**

3.31. Improving awareness of commercial opportunities

3.32. **Our procurement portal (see para 3.5.3) will be used during the construction and the O&M phase. The Operator will have regular dialogue with new local supply chain companies to support their registration.** Any Tier 1 suppliers appointed during the O&M phase will be required to use the procurement portal to advertise opportunities.

3.33. Encouraging competitive procurement processes and more open competition

3.34. Making a long-term commitment to the North-East of England will likely give the supply chain the confidence to establish itself near the O&M base. DB3 will support this through its engagement in the development of the North-East of England Cluster (para 3.28.3).

3.35. Regular engagement will be undertaken to support and develop the supply chain throughout the O&M phase. **DB3 will work with the WTG OEM to ensure that the necessary skills and competency requirements are understood. This will enable post-warranty opportunities to be available for more suppliers to compete for O&M contracts**.

4. Innovation Criteria

4.1. **Innovation Commitments:**

4.1.1. We innovate to realise safety improvements, cost reduction benefits and schedule enhancements. DB3 commits to the following key actions to deliver innovation in the UK OWF supply chain:

- We will be open to approaches by Tier 1s wishing to undertake Research and Development (R&D) activities.
- [redacted]
- [redacted]
- We will continue to support the development of the North-East of England Cluster, with a focus on utilising innovation and technology.
- We will be the first UK OWF to utilise [redacted]
- We will continue to share our innovations and lessons learnt through engagement with the Carbon Trust's Offshore Wind Accelerator (OWA).
- We will continue to work with the British Geological Survey (BGS) and share our data to assist the academic community in its understanding of offshore engineering geology and geology in general.
- We will write a joint academic paper with Geo on our innovative [redacted]
- Following equipment commissioning, [redacted]
- We will share our lessons learnt from our O&M innovation with the wider industry, and through our work with the North-East of England Cluster, once the wind farm is operational.

4.1.2. Additional commitments and actions are captured through this section as bold text.

4.2. Research and Development

4.2.1. The OWA is the Carbon Trust's flagship collaborative R&D programme. The joint initiative was set up between the Carbon Trust and 9 offshore wind developers in 2008; 2 of which were SSE and Equinor.

4.2.2. SSE supports the Engineering and Physical Sciences Research Council Centres for Doctoral Training, provides funding to the Technology Innovation Centre at the University of Strathclyde, and has a research partnership with the University of Strathclyde supporting energy research and innovation.

[7] Subject to any IP restrictions.

4.2.3. SSE sits on the steering committee of the Power Curve Working Group[vii], which aims to improve the modelling of wind turbine performance in real world wind conditions, e.g. in the complex wind shear conditions experienced offshore as a result of the temperature difference between sea and land. It has undertaken testing and benchmarking of software tools ahead of their release to the wider group and has contributed analytics from power curve tests from several of SSE wind farms.

4.2.4. SSE participates in the IEA Task 32[viii] working group which promotes the use of LiDAR for site assessment, power performance, turbine loading and control, and complex flow measurement. It has been particularly involved in the definition of use cases for LiDAR deployments and assessment of upstream induction effects for large rotor turbines.

4.2.5. Equinor makes significant annual commitments to the funding of research and innovation, [redacted] By 2020, it intends to increase spending on innovation related to low carbon and renewable industries to 25% of the total research and innovation budget. [redacted]

4.2.6. *British Geological Survey (BGS)*

4.2.6.1. Although BGS has conducted work on other OWFs, the DB projects are the first where it has been involved from early development with PhD students, very active research and peer reviewed publications. BGS participated in the borehole campaign planning in early 2018 as part of a commercial contract. It is now helping model the geology of the site to develop our foundation design requirements. BGS has utilised (at no cost) the DB JV data to extract additional information for scientific research relating to the geology of DB and the North Sea; it has produced 14 technical reports for the OWF industry, 3 peer reviewed journal papers and it has another 5 journal papers planned. The data collected on our behalf has been used in 5 PhDs. **Academia has benefitted from our commercial collection of data to further the understanding of offshore engineering geology, and geology in general.** The information contained within the ground model is currently commercially sensitive; however, once the DB JV projects have been awarded CfD contracts, **we will continue to allow BGS to use this data, at no cost, for future PhDs**.

4.2.6.2. **In addition to the formal scientific publications, members of our team have been instrumental in sharing best practice and lessons learnt**. They have presented to a range of research institutes and conferences in the UK and worldwide. Forewind invited BGS and Historic England to a workshop to review the collected data as Historic England has an interest in the upper geology at DB. **We intend to hold similar workshops to provide stakeholders with new data following the completion of future survey campaigns**.

4.2.7. *The National Offshore Wind Turbine Test facility (NOWTTF) at Hunterston*

4.2.7.1. This is the UK's only onshore test facility for offshore wind turbines supported by Department for Business, Energy and Industrial Strategy (BEIS) funding[ix]. The funding forms part of the Efficient Offshore Wind Programme. Key innovative projects delivered:

a) Siemens' use of its 6 MW direct drive test WTG to refine the design of its 7 MW WTG, which was then used at BOWL; and,

b) A report was produced by DTU Wind Energy[x], which assessed whether a LiDAR placed on the nacelle or the TP of an offshore wind turbine could be used for power curve verification instead of a meteorological mast. The results were obtained from an offshore wind turbine at GGOWL. This work was supported by funding awarded to the NOWTTF by the Department of Energy and Climate Change (DECC) and the Technology Strategy Board's Offshore Wind Component Technologies Development and Demonstration Scheme.

4.2.8. SSE supported students at Ayrshire College by providing tours of the Hunterston site. Technical presentations were made to the students on civil works, electrical systems and wind measurement using LiDAR devices.

4.2.9. **We are involved in several R&D projects and are assessing other R&D opportunities**. Key projects for DB3 include: detailed analysis of wind measurements recorded at DB; investigation of complex phenomena and their impact on energy yield and turbine performance; SSE is supporting a University of Strathclyde PhD candidate studying the [redacted] and, investigation of wake and blockage effects on large offshore WTG clusters utilising a bespoke in-house tool, which is novel given the extensive size of the DB sites.

4.2.10. At an industry level we are involved in:

a) The OWA Boundary Layer Profiling project, the Wake Model Benchmarking project and the Blockage Effects project; and,

b) The Carbon Trust's WFC project, which is assessing options for a demonstration site.

4.2.11. **We are involved in comparing turbine loads in idealised and site-specific conditions to inform our understanding of WTG and foundation design**. This will inform our component assumptions and ensuring WTG asset life without excessive CAPEX.

4.2.12. **To optimise turbine layout, we are undertaking detailed design of the project using innovative tools and the** [redacted]. We have considered a simplified LCoE calculation to assess any trade-off between CAPEX, OPEX and energy yield to maximise project value. We have developed internal Computational Fluid Dynamic modelling capability to improve on industry-standard tools for large wind farm energy yield. We are considering strategies to [redacted] whilst assessing opportunities to reduce overall wake losses.

4.3. Technological Development

4.3.1. Digitalisation will bring advances in safety, security, sustainability, productivity and cost-efficiency; Equinor will invest £92-185 million in this area by 2020. **Digitalisation is core to our strategy** and will focus on using the data collected during construction and operation of OWFs **to improve**

efficiencies and realise cost savings. The outputs of Equinor's Digitalisation Unit will be applied to DB3 wherever feasible.

[redacted]

4.4. Innovative procurement and contracting practices

4.4.1. [redacted]

4.5. Boosting innovation

4.5.1. Equinor Innovate[xi] connects with organisations that can help find solutions to business challenges. It produced the 'heavy maintenance of offshore wind turbines' competition which sought ideas for more efficient approaches to maintenance or replacement of heavy equipment during the operation phase of OWFs, results of which could be of direct use at the DB projects. Equinor will work with the 3 winners to further develop the solutions[xii].

4.5.2. Techstars Energy Accelerator[xiii] is a 13-week intensive start-up accelerator for companies who work on disruptive solutions within oil and gas, renewables, new business models and digitalisation. Ten start-up companies have been selected from hundreds of applicants across 38 countries. They will seek to accelerate their solution within 13 weeks, with funding awarded and access to a global network of experts from Equinor, Techstars, and the partnering companies KONGSBERG and McKinsey & Company.

4.5.3. Under the proposed ORE catapult and Carbon Trust Offshore Wind Innovation Programme, we are already delivering aspects of all 5 of the proposed missions. Equinor's Batwind project is developing grid integration storage technology (see also 4.29), Hywind Scotland[xiv] has delivered emerging floating turbine technology in UK waters (see also 1.9) , and the DB projects are actively engaged in developing and/or utilising smart O&M, next generation WTGs and ensuring UK leadership in future OWF development.

4.6. Sharing of best practices and lessons learnt

4.6.1. BOWL presented its innovation lessons learnt at the Scottish Renewables Conference, explaining how it was able to select the Siemens SWT-7.0-154 WTG despite it being an unproven machine. It outlined how it selected jacket foundations despite there being an untested supply chain for the volume of jackets it required. It also detailed how it came to choose to construct 2 innovative OTM platforms as opposed to a more conventional Offshore Substation Platform (OSP) (see **Annex 7**).

4.6.2. In 2010 SSOWF developed a solution to a fault observed in relation to the grouted connection between the MP and the TP that had been detected at several European OWFs. The solution was then shared with the wider industry and applied by other developers experiencing the same fault.

4.6.3. Forewind pioneered a technique for offshore wind whereby drones were used for inspection work for the 2 meteorological masts installed in the DB Zone. Equinor then won the RenewableUK H&S Innovation Award 2018 for its use of drones to inspect wind turbines at SSOWF (see **Annex 8**). Using drones is a safer and more cost-effective way of carrying out work previously carried out by rope access. The use of drones was a lesson from Equinor's oil and gas business.

4.7. **WTGs**

4.8. Research and Development

4.8.1. [redacted]

4.9. Technological Development

4.9.1. **We will utilise the** [redacted] **turbine technology which provides the best LCoE**. The turbines we will use at DB3 may not been used before and may not have type certification ahead of CfD award.

4.9.2. [redacted]

4.9.3. [redacted]

[redacted]

4.10. Sharing of best practices and lessons learnt

4.10.1. **Our shareholders share their best practices and lessons learnt through the OWA and The Crown Estate Developer days. We will continue to do this in relation to DB3.** This will include lessons learnt through the digitalisation work that will be employed through the O&M phase (see para 4.9.3)

4.11. **Foundations**

4.12. Research and Development

4.12.1. The Pile Soil Analysis (PISA) project investigated how MPs behave in diverse soil and environmental conditions to refine design methodologies and reduce fabrication costs. PISA involved tests of 28 MPs at 2 different onshore sites and the results show MPs to be feasible for next generation WTGs for water depths encountered at DB3. **We will utilise the latest design methods for MPs developed by the PISA project**. Moreover, methods of optimising loading on the substructure will be explored with the WTS to reduce costs.

4.13. Technological Development

4.13.1. SSE was a partner in DOWNVInD ((Distant Offshore Windfarms with No Visual Impact in Deepwater) which included the Beatrice Demonstrator project. The project demonstrated that jackets were feasible substructures for offshore wind turbines and was the world's first "deep water" wind farm.

4.13.2. BOWL is the largest OWF in the world built using jacket foundations. The jackets are also the deepest water fixed foundations of any OWF, each weighing c.1,000 tonnes and being installed in water depths of up to 56 metres.

4.13.3. Equinor and SSE promoted the use of suction bucket foundations resulting in their use for meteorological masts for both the DB Zone and the Seagreen Zone (see **Annex 9**). These represented the first use of suction buckets for UK offshore wind. This was followed by a joint study run as part of the OWA. Equinor instigated and managed the project; whereby, trial installations of suction buckets were carried out at DOWF and in the DB Zone. Equinor then selected, suction buckets as the foundation type for the DOWF offshore substation – a UK first.

4.14. Innovative procurement and contracting practices

4.14.1. **We will adopt a collaborative approach with each of the contractors in terms of payment terms** [redacted] This builds on our experience from JV shareholder projects and supports contractor stability. Owing to the project's condensed timescale, and the potential financial risk to a sole contractor, we may elect to contract with 2 or more suppliers. There may be synergies between 2 or more suppliers, and we will support Tier 1s that elect to use other fabrication companies as subcontractors.

4.15. Innovative or new installation methods

4.15.1. Seaway Heavy Lifting developed an internal lifting tool for lifting jackets for BOWL, and the same tool and method was also utilised for the OTMs. This tool was innovative and could be used to realise quicker installation and cost reduction on future jacket foundation offshore projects.

4.15.2. We have supported the OWA BLUE PILOT project for quieter installation of offshore foundations which is aiming to reduce noise levels by up to 20 dB, reducing potential impacts on marine mammals, and is also predicted to reduce fatigue damage during installation on the pile by up to 90%.

4.16. Sharing of best practices and lessons learnt

4.16.1. [redacted]

4.17. [redacted] **Export, Inter-array and Onshore Cables**

4.18. Research and Development

4.18.1. HVDC allows active and reactive power to be independently controlled at each HVDC station. This enables stable, rapid and accurate voltage control and is used onshore to meet the grid code requirements for grid support. HVDC transmission systems, therefore, offer higher reliability and availability, require less maintenance, offer low power losses, and can transfer high loads over long distances [redacted] This makes HVDC well suited for the DB projects.

4.18.2. [redacted]

4.19. Technological Development

4.19.1. BOWL was the first OWF to use lightweight OTM platforms rather than traditional offshore substations, resulting in a significant cost reduction. These platforms were designed and built in the UK.

4.19.2. **We have driven the development of the first unmanned HVDC platform concept. DB3 will be the first UK OWF to utilise enhanced HVDC equipment**. Through challenging existing concepts, we have reduced the topside weight from [redacted] for the same MW capacity. This weight reduction has been driven by the project team and is an enormous advancement in competitive [redacted] design.

4.19.3. [redacted]

4.19.4. [redacted]

4.20. Innovative procurement and contracting practices

4.20.1. [redacted]

4.20.2. **Implementing best practice from Equinor's oil and gas experience,** [redacted].

4.21. Innovative or new installation methods

4.21.1. [redacted] **We will maximise onshore commissioning to reduce offshore installation time and minimise the time between platform installation and energisation**.

4.22. Sharing of best practices and lessons learnt

4.22.1. **We will make use of competence from previous unmanned platform projects**. The HVDC contractor is responsible for the overall electrical system across the whole project, because of lessons learnt from [redacted] and earlier OWFs.

4.23. **Onshore Construction**

4.24. Innovative or new installation methods

4.24.1. **We will ask each potential supplier to demonstrate new and innovative ways to undertake the works**. We are aware of developments in Germany with regards to the ploughing-in of cables onshore, and we will assess the viability of these techniques for DB.

4.25. **Offshore Construction/ Marine Installation**

4.26. Innovative or new installation methods

4.26.1. SSE, along with ScottishPower Renewables and the University of Strathclyde, developed a tool for analysing offshore marine logistics during construction. This is the only tool available that can analyse the fully integrated OWF construction programme. **The tool was used on BOWL and will also be used on DB3**.

4.26.2. DOWF had 2 different cable dimensions and long cable lengths. The carousel was divided into 2 compartments, allowing flexibility during the installation sequence. The cables were cut to exact lengths which allowed for a more efficient installation campaign. Moreover, unnecessary joints were eliminated which reduced the risk of later failure during operation.

4.26.3. In 2017 Equinor installed the world's first floating wind farm, Hywind Scotland. It was the world's first installation of a fully assembled WTG onto a floating structure. Saipem's semi-submersible crane vessel, S7000, conducted the installation. The stability frame was c.25% of the material of a traditional lifting frame, and it allowed for a reduced execution schedule. This new method has been nominated for a Structural Award in 2018 by The Institute of Structural Engineers. **We will continue to stimulate the use of new and innovative methods for marine operations.** [redacted] This installation method, combined with the barge feeding of parts to the field, will likely reduce installation time by two-thirds; thereby, decreasing installation costs and significantly improving the marine operation schedule.

4.26.4. **We have challenged numerous contractors to engage with us to work on several innovative installation methods to facilitate and expedite the assembly and installation of WTGs offshore**:

a) **We have encouraged the market to evaluate and develop methods to install WTG foundations without use of anchors** i.e. using Dynamic Positioning (DP). Saipem, Heerema and others have designed installation frames to overcome the challenges of using a floating vessel. Others, like OHT, have designed an outrigger system to control the installation by integrating the outrigger force with the vessel DP system. OHT is also exploring a new vessel that can shuttle to the field carrying more than 10 MPs in one trip. **DB3 has met with OHT to discuss this solution and how to progress it**.

b) Conventionally, a jack-up construction vessel is used for WTG installation; however, due to the increasing size of turbines, many vessels in the existing fleet are rapidly becoming obsolete. [redacted].

c) Equinor supported the development of Saipem's stability frame which was used successfully for the first time on Hywind Scotland.

d) [redacted]

e) [redacted]

4.27. Sharing of best practices and lessons learnt

4.27.1. Forewind was an active partner in the Carbon Trust's Offshore Renewable Joint Industry Programme project looking at the efficacy of Acoustic Deterrent Devices (ADDs) as marine mammal mitigation during piling. ADDs could have the potential to reduce piling down time by providing a system that could work in poor visibility (where traditional marine mammal observers (MMOs) were not able to guarantee marine mammal clearance), whilst also reducing the need for additional vessels and personnel on site; thereby, reducing cost and H&S risk. This was of value to the DB projects where the addition of small vessels to support MMOs was considered a greater risk due to distance from shore. DOWF was the first English project to employ ADDs as the primary mitigation method for marine mammals.

4.27.2. The DB meteorological mast project was the first in the UK to use a "human-free" technique to place the lattice tower of the mast on top of the awaiting foundation. This pioneering technique was developed to reduce one of the biggest H&S risks during OWF construction (see **Annex 10**). Since then, this approach has been widely employed in the offshore wind industry. For this initiative, Forewind was awarded runner up in RenewableUK's H&S Award in 2014.

4.27.3. Forewind introduced a 'practice run-through approach' to all offshore operations (see **Annex 11**). This consisted of full in-harbour enactments of each activity to be undertaken on vessels during surveys offshore to improve the safety of all operations at sea and embed good HSE practice. This process was implemented for every vessel working for Forewind and this lesson was shared with the wider offshore wind industry. For this initiative, Forewind was awarded runner up in RenewableUK's H&S Award in 2013.

4.28. **Operations and Maintenance**

4.29. Research and Development

4.29.1. Equinor was the first OWF developer to install battery storage for an OWF. The Batwind project is a 1 MWh battery-based storage pilot, installed at the Hywind Scotland onshore substation, developed

in co-operation with Scottish universities and suppliers under an MoU between Equinor, the Scottish Government, ORE Catapult and Scottish Enterprise. The development of battery storage is considered a valuable next step for offshore wind to mitigate intermittency and optimise output.

4.29.2. GGOWL was awarded the RenewableUK H&S award in 2017 for its work with vessel monitoring systems, with its partner BMO. The monitoring system enabled the team to protect the technician workforce from motion sickness and whole-body vibration; thereby, improving the working environment and the well-being of employees working offshore[xv].

4.29.3. There is limited use of daughter craft in UK offshore wind; therefore, Equinor has supported an OWA project by providing access to Hywind Scotland, DOWL and SSOWL to test the innovative Sea Puffin vessel[xvi]. Initial results look positive and could have potential as a low-cost option for deploying technicians to the WTGs. **We will continue to follow the OWA project and evaluate the technology and its suitability for operations at DB.**

4.30. Technological Development

4.30.1. GGOWL used CHPV, a local media company, to produce a 360-degree virtual media tour of the OWF, including the inside of a turbine. This capability has decreased the need for contractor onboarding by reducing the need to go offshore. The tour can be used to plan offshore works and shows in detail the positioning of equipment and anchor points. GGOWL also has familiarisation equipment, a mock-up of a MP and TP, at the O&M base. This enables staff to run through activities before going offshore, and it can also be used for training on severe weather days when the technicians cannot go offshore. Overall, the coupling of the virtual tour and the familiarisation equipment reduces operational costs and improves safety.

4.30.2. SSOWF carried out analysis on the process for evacuation of personnel from turbine nacelles. It was found that the existing system was slow and could only allow evacuation of 2 individuals at a time (however, 6 were permitted to be in the nacelle at any time). In the case of a fire in a nacelle, this was considered to present a notable H&S risk. Alternative systems were sought and the system delivering the most benefit technically and operationally was identified, known as the Cresto® Smartline (see **Annex 12).** This system can attach to a variety of anchor points in the turbine and allows parallel evacuation of all individuals and was first used offshore by SSOWF.

4.30.3. SSOWF ran a pilot for drone inspection of wind turbine blades. SSOWF worked with the preferred supplier (Martek) to develop the necessary skills for the offshore industry. This included improving stability whilst operating on vessels and specific offshore training requirements for the operators. This pilot project delivered much better images than had traditionally been achieved through technicians working on ropes. It also added a new entrant to the offshore market who offered innovative methodologies (i.e. using smaller vessels) and competitive prices. The removal of the need for working at height also significantly reduced the H&S risk associated with this activity. This technique is now being rolled out for the wider wind farm inspection campaign and lessons have been shared with DOWF for post OEM work.

4.30.4. DOWF was the first OWF in the UK to utilise a SOV[xvii]. This concept has proved very effective compared to traditional methods, allowing safe and efficient transport of people and equipment to WTGs. The system has an adjustable pedestal which allows it to land at various heights. This enables technicians to gain access for maintenance tasks in higher sea states; thereby, significantly improving access throughout the year when compared to a transition CTV concept where access limits are typically around 1.5 metre significant wave height. Additionally, having the technicians living aboard an SOV means that the time on task at the WTG is significantly greater as the transit time each day is minimal. The success of this concept has been shared with the industry through an ORE catapult study and is now considered common place now that OWFs are being constructed further offshore.

4.30.5. BOWL has been working with an innovative CTV boat company WaveAccess, who built a fully functional CTV mono-hull demonstrator. The project is currently considering sea trials for the CTV.

4.31. Innovative procurement and contracting practices

4.31.1. GGOWL's campaign maintenance strategy has focused on availability versus full-year yield. To keep costs down, it has attempted to avoid the peak April to October period. [redacted]

4.31.2. GGOWL has aggressively pursued lean servicing to reduce the time engineers spend offshore, which delivers cost and safety benefits. The team has considered the cost benefits of the warranty against the cost of preserving a maintenance schedule which delivers the precise warranty requirements. The team has then risk assessed the potential impact of not maintaining equipment under the warranty conditions to decide what to include in the maintenance schedule and what to exclude. Risk appetite has been increasing on GGOWL in relation to this approach, and these lessons have been shared with DB3.

4.32. Innovative or new installation methods

4.32.1. Equinor collaborates with universities to deliver R&D through Equinor's internship programme. Examples of R&D projects conducted by interns include an access assessment for Hywind Scotland and the use of a Distributed Temperature System to monitor temperature within the export cable.

4.32.2. Due to the distance from shore it is envisaged that helicopter operations may play a significant role in both the construction and operational phases of the project, if more than one DB project is awarded a CfD in this round. **We are considering the viability of deploying the first offshore heli-base in the UK on DB for supporting regular O&M activity on an OWF**. The innovative offshore heli-base concept uses a self-elevating mobile platform equipped with accommodation and helicopter facilities, which would allow us to reposition the platform to take advantage of synergies between the DB projects and with any other local OWFs. A helicopter would be permanently based offshore allowing efficient access to the WTGs for maintenance tasks via heli-hoisting, and during the construction phase to provide access for commissioning tasks. By locating a helicopter permanently close to the field we could mitigate our distance from shore and ensure a robust

emergency response allowing rescue and medical personnel to be rapidly mobilised in the event of an incident.

4.32.3. **Equinor has a dedicated flight safety division, responsible for all company aviation operations, which is involved in developing the helicopter concept for DB.** Both shareholders participate in the UK Offshore Renewables & Aviation Forum which produces and updates the best practice Offshore Renewables Aviation Guidance. Equinor is part of an OWF working group setup by HeliOffshore which aims to publish common safety standards and practices based on peer-reviewed guidelines.

4.32.4. The O&M base will need to be sited near to a heliport to enable efficient crew-change. There is no local commercial heliport, so we are exploring using an existing airport. We might establish a heliport at the O&M base itself, but the solution will likely depend on which port is selected as the O&M base. **DB3 will continue to explore options to invest and set-up the necessary facilities, including the option of establishing a heliport at Durham Tees Valley Airport or Newcastle Airport, and working with neighbouring OWFs. Further meetings will be held airport operators in 2019 to discuss potential investment opportunities.**

4.33. Sharing of best practices and lessons learnt

4.33.1. Equinor has given more than 50 presentations, at industry conferences in the UK and abroad, in the last 2 years on the innovative Hywind Scotland project and floating technology. In October 2018, Equinor supported a workshop coordinated by RenewableUK, Scottish Renewables and ORE Catapult, to develop a shared sector view on the path to building a successful UK floating offshore wind market.

4.33.2. The DB3 O&M logistical concept is based on analysis of site specific conditions, lessons learnt from the shareholders' most relevant existing wind farms (DOWF and BOWL), and Equinor's experience from marine vessel and rig operations, as well as other helicopter operations offshore.

4.33.3. The JV partners have played a pivotal role in drafting the inputs for the UK sector deal, specifically in relation to innovation in O&M and how collaboration with the ORE Catapult programme and its offshore wind innovation hub can promote this. **We will continue to support the North-East of England Cluster to best utilise the skills, capabilities and infrastructure to bring value to future O&M operations with a focus on utilising innovation and technology.**

5. Skills Criteria

5.1. **Skills Commitments**:

5.1.1. The DB JV is keenly aware that skills begin in schools and colleges, hence its commitment to engage with educational establishments and programs to progress the skills agenda.

5.1.2. DB3 commits to the following key actions to deliver skills in the UK offshore wind supply chain:

- We commit to 2 apprenticeships biennially during the O&M phase of the wind farm[8].
- We commit to a Community Fund to fund Science, Technology, Engineering and Maths (STEM), scholarships and other community projects[9].
- We will reengage with the Champions for Wind programme (see para 5.9.2).
- We commit to using the RenewableUK skills website to advertise opportunities with DB3 to support the Sector Deal and the UK Government 2030 targets.
- We will collaborate with key local stakeholders to develop a skills plan for the O&M phase.
- We will support the establishment of local training providers, as required by the skills plan.
- We will build on skills initiatives at existing shareholder OWFs to offer similar support in the North-East of England.

5.1.3. Additional commitments and actions are captured through this section as bold text.

5.2. **General Project/Shareholder Skills**

5.3. Inclusivity

5.3.1. SSE believes that an inclusive workplace culture is more than seeking to improve the diversity of specific characteristics such as gender, race, disability or age. Inclusion means creating an environment that is open and encouraging of all types of difference, including physical differences, social backgrounds and ways of thinking. It has an Inclusion Strategy which aims to ensure equal opportunities are offered to everyone.

5.3.2. In 2016, SSE was the first FTSE Company to publish its UK gender pay gap, using the UK Government draft regulations. SSE has set new initial gender balance targets for senior leadership, with the aim of achieving them by 31 March 2021. In 2017/18, SSE was one of just 6 companies in the UK to be included in the inaugural Bloomberg Gender-Equality Index.

5.3.3. Paying the Living Wage to employees in the UK is core to SSE's approach of reducing inequality. Since April 2014, it has been rolling the Living Wage out through its supply chain. In early 2018, SSE was ranked number 1 in the FTSE350 for inclusive job growth in Britain.

[8] Final number will depend on the number of DB projects progressed and the lessons learnt from delivering apprenticeships at SSOWL, GGOWL and BOWL regarding how many apprentices can be in the training system at one time.
[9] Figure will depend on the number of DB projects progressed.

5.3.4. SSE has increased its maternity and adoption pay to 21 weeks full-pay. It has introduced a gradual return to work scheme to support maternity and adoption leave returners, with new parents offered the option to work 80% of their contracted hours but receive full pay and benefits for up to 6 months. It is rolling out agile working aided by significant investment in improved technology applications.

5.3.5. Equinor believes that a diverse and inclusive workplace is essential. It is improving diversity and inclusion in the UK organisation, including increasing the recruitment of women and the number reaching senior positions. It engages with UK employees to understand how working practices and environment may impact on inclusivity in Equinor UK. It intends to ensure a balance of diversity in its key leadership activities by incorporating inclusive leadership training into its leadership development programmes.

5.3.6. Equinor's new recruitment policies have delivered an increase in the number of female graduates and apprentices and aims for 50% female recruitment. Its first female apprentices started at SSOWF in January 2019. In the last 12 months there has been a 5% increase in women in Equinor New Energy Solutions (NES). It invests in women through its talent programmes, mentoring, and via the delivery of unconscious bias training to all its leaders.

5.3.7. Equinor recognises that certain roles within offshore wind are less gender balanced than others and specific initiatives have been implemented to redress this balance. It encourages its female employees to speak at schools and job fairs, and work on programmes which seek to expose women to the opportunities offered by the industry.

5.3.8. In 2016, the SSOWF Community Fund awarded a grant to Inspired Youth to deliver a programme aimed at motivating girls in 5 North Norfolk secondary schools to study STEM subjects and to consider a career in engineering or energy. Inspired Youth then hosted a conference at the SSOWF Visitor Centre to mark 'International Women in Engineering Day'.

5.3.9. All employees in the Equinor group will soon qualify for paid parental leave. A new policy will allow 16 weeks of paid leave for all employees having children (from 1 January 2019).

5.4. Communities

5.4.1. SSE supports its local communities through its Be The Difference scheme, in which each employee can take a day away from their usual job to participate in a community project of their choice[xviii]. SSE also operates a leading community investment programme which delivers financial support to a diverse range of strategic projects near its renewables developments. In FY 2017/18 it invested £5.18[xix] million. To date, SSE operates 32 community investment funds across the UK. Its community investment report is available online[xx] and provides case study examples of investment awarded in FY 2017/18.

5.4.2. DB3 **commits to a community fund to finance STEM skills development, scholarships and wider community projects**.

5.5. Assessment of Future Skills Requirements

5.5.1. When the DB JV was formed in August 2017, we considered our team needs using our experiences on BOWL and DOWF as the baseline. We will reassess these needs once the result of the Round 3 CfD auction has been announced, as there will be synergies if more than one DB JV project is awarded a contract. The current project team includes 39 individuals working full time on the projects with a further 56 working part time.

5.5.2. The DB projects are expected to create between 1600 and 2600 direct and indirect jobs during the construction phase, and between 300 and 500 direct and indirect jobs during the O&M phase (see also paras 1.4 and 3.28.3). We will make the local population aware of employment opportunities by advertising locally and working with local job centres.

5.5.3. **We have already held one, and we are committed to holding 2 further, supply chain events.** These will be supported by local and regional business support organisations and will allow the project to engage with potential lower-tier suppliers. These events allow us to understand the skills and products available in the local area, and for business to understand what skills they need to possess to be successful within the industry. At the first event in May 2018, held in the North-East of England, 225 businesses attended to learn more about the DB projects and what opportunities may be available. Additionally, we will require/encourage Tier 1s to hold their own engagement events (see para 2.5).

5.6. Assessment of Skills Gaps

5.6.1. We have in-house competencies in all stages of project development, execution and operation.

5.6.2. SSE members of the project team all have previous offshore wind experience from BOWL and/or GGOWL, and SSE makes best use of team skills by transferring skills and personnel from other power generation projects such as onshore wind. SSE has a strong complex engineering background from over 75 years of tunnelling and construction work experience in its hydro business.

5.6.3. Equinor members of the team have previous experience from OWFs such as SSOWF, DOWF and Hywind Scotland, and it has a strong marine discipline with experience from numerous oil and gas installation projects worldwide over more than 40 years. Wherever possible, Equinor seeks to use our existing competence from oil and gas to directly transfer skills to the NES business area. Currently NES has 233 direct employees but over 1500 additional individuals supporting these activities from across the business.

5.6.4. **DB3 will conduct a full assessment of skill requirements per package for construction. We will maintain comprehensive objectives, training plans, and on the job training for each member of the team. We will ensure the Tier 1 suppliers have the same, or a similar system, in place for their staff and key subcontractors. We will conduct performance reviews and ensure training is developed and delivered to ensure sustainability in all competences. We**

will also ensure that the competences and experience levels are balanced across each shift. We will audit the Tier 1s to confirm they are maintaining the required standard.

5.7. Investment in Skills and Training

5.7.1. SSE believes in creating long, sustainable careers where everyone can progress within the organisation. In 2017/18, 1,316 vacancies across the company were filled internally, and SSE invested a total of £25.2 million in pipeline programmes and employee learning and development, with an average of 22 hours of training per full-time equivalent employee.

5.7.2. Equinor seeks to fill roles within its NES team internally wherever feasible to bring competence from oil and gas directly to offshore wind. Equinor works closely with our 8 internal academies in 'Equinor University' to design courses that will retain our existing oil and gas workforce in renewables. These courses are wide ranging and cover aspects from operational to commercial activities.

5.7.3. SSE runs a four-week summer internship as part of its ongoing Career Ready programme. Career Ready is a national charity that links schools and students with employers across the UK to help prepare them for the world of work through mentoring, work internships and masterclasses. SSE has been involved with Career Ready for 5 years and has helped 57 young people gain work experience giving them the skills, confidence and networks to support them in achieving their full potential. Career Ready provides a 2-year programme for 15 to 18-year olds which sits alongside their normal fifth and sixth year senior school studies[xxi].

5.7.4. Equinor promotes internships on an annual basis in the communities local to its projects. Historically, a skills day has been run at the University of East Anglia to encourage local candidates for the internship programme. Selected candidates can engage with some of the world's foremost technical environments and learn about Equinor and the industries it is involved in. Each summer intern will be a part of Equinor's drive to solve tomorrow's energy challenges today. Several interns have worked across Equinor's offshore wind projects.

5.7.5. SSE runs an Education Resource Centre at its Fiddler's Ferry Power Station. The centre provides teaching on topics including safety, environment, sustainability, energy from coal and biomass, flue gas desulphurisation and more. In addition, the nature reserve offers a wealth of wildlife, ideal for studying habitats, food chains/webs and ecological sampling from primary school level to university.

5.7.6. Equinor runs a Young Imagineers competition, inviting youngsters to articulate what they would create to make tomorrow's world a better place[xxii]. Equinor's sponsorship of Wonderlab at the Science Museum: The Equinor Gallery is intended to build on children's natural curiosity in STEM to ensure long-lasting engagement. Equinor believes innovation is the key to unlocking the door of future value creation.

5.7.7. GGOWL has familiarisation equipment, a mock-up of a MP and TP, at the O&M base enabling staff to train and trial activities before going offshore. It is a useful training tool for severe weather days when staff cannot go offshore.

5.7.8. The SSOWF Community Fund contributes £100,000 per annum to the local community and focuses on climate change, sustainability, and environmental projects. It introduced a Bursary Scheme[xxiii] to help young people from low income families in Norfolk to study engineering at one of three Norfolk colleges. Each year funding is available for 20 students to each receive a bursary of £500 per annum to study the BTEC Diploma in Engineering Level 3 through to graduation.

5.7.9. The DOWF community fund provides £100,000 of grants per annum to support STEM education initiatives for the benefit of young people living in the Great Yarmouth, Breckland and North Norfolk districts of Norfolk. The aim is to increase the skills in the region by targeting development of interest in STEM in 12 to 16-year olds.

5.7.10. The "Hywind Hub" has recently been opened in Peterhead, Scotland as a project aiming to enhance the STEM ambition, attainment and future employment across Aberdeenshire. The Hub is a state of the art, learning environment in the local Peterhead Academy. The Hub has been fitted out with solar, wind and hydrogen cell technology that will be used by students across the region. It not only offers a physical space to facilitate renewable technology discovery but in addition, the project is delivering renewable education programs across Aberdeenshire, including: secondary and primary workshops, STEM training of primary school staff, STEM community days and developing older years students as leaders and STEM ambassadors for younger years.

5.7.11. We have assessed our needs for the construction phase and have also considered the resource requirements should multiple DB projects be successful in the next CfD auction. The necessary technical competence exists within the turbine installation engineering community; however, there will be an initial additional training requirement as the installation engineers will need training to enable them to be transported out to site by helicopter.

5.7.12. **We will encourage the successful Tier 1 contractor(s) to give guest lectures/presentations, both from a commercial and technical perspective, to local college/university students**. This may assist them with any courses they may be undertaking or may give them interest in pursuing a course in civil engineering, quantity surveying or procurement.

5.7.13. [redacted] **We will involve operational resources in the project organisation during the execution phase to ensure these lessons are shared. Following this, we will establish a series of internal courses** [redacted] **and equipment in advance of the operations phase to continue this learning**.

5.7.14. We are considering purchasing control system replicas to undertake 3rd party verification, with competent research institutes [redacted] of real-time grid and system analysis. This will enable us to simulate control of the plants including operational response to faults or shutdowns during actual operation. The replicas could also be used for staff training.

5.8. Apprenticeships

5.8.1. SSE is currently training c.500 apprentices, spending an average of £80,000 per person[xxv]. Apprenticeships are offered across the business and across the UK, including in Energy Networks, Generation and Renewables, and our Electrical and Mechanical Contracting business. SSE has a STEM forum which aims to: provide a support and networking group for SSE employees pursuing or interested in pursuing or promoting careers in STEM; provide information and promote career paths/prospects within SSE; provide support to women in SSE and promote STEM subjects in schools and universities. SSE has built relationships with feeder colleges and universities offering bespoke female events to encourage more women into its entry level STEM roles. SSE has used its partnership with education charity Teach First to work with schools in areas where SSE has struggled to hire apprentices.

5.8.2. GGOWL currently has 2 apprentices as 4 apprentices recently passed through the training system. The apprentice training scheme is based upon WTG technicians or balance of plant technician needs, but GGOWL also offers 'junior' engineer roles in disciplines including electrical engineering, SCADA engineering, and Control & Instrumentation (C&I).

5.8.3. We acknowledge that skill shortage is a real threat in the industry. Owner/operators will always recruit but will often lose out to lucrative competitive offers and the lure of independent contracting opportunities once an engineer is deemed to be 'experienced'. Apprentices ensure skill gaps are met and they are often loyal due to the training and development experience invested in them.

5.9. Sharing best practice and lessons learnt

5.9.1. Experience from other OWFs has shown that skills deterioration ('skills fade') is more pertinent in the supply chain during stand down times in winter due to fewer active working hours. **To combat skills fade we will conduct regular "Stand Down for Safety" days, frequent familiarisation training, in addition to formal training**. **We will make best use of severe weather day opportunist training activities. We will also conduct regular audits (both internally and in relation to the Tier 1s and their subcontractors). We will maintain a project training matrix to record skills that have been demonstrated.**

5.9.2. During the development of the DB projects, Forewind, in partnership with the Humberside Engineering Training Association, developed an innovative careers education engagement programme called Champions for Wind[xxvi]. The programme identified and worked with a network of approximately 10 secondary and special school teacher "champions" in the Hull and East Riding of Yorkshire area. The programme was extended with 10 teachers in the Teesside area appointed in mid-2012. A third cohort of teachers was added in mid-2013, and they presented their progress at a workshop in June 2014. As part of the development programme, several resources were made available to schools interested in teaching students about wind energy and associated careers. **The DB JV will reengage with the Champions for Wind programme through liaison with local groups to work collaboratively to design the optimum engagement strategy.**

5.10. **O&M**

5.11. Assessment of Skills Gaps

5.11.1. The JV parent company projects have identified assorted opportunities to use local skills to fill requirements for the projects. GGOWL has been able to utilise ex-fisherman on their CTVs whilst SSOWF has actively sought to recruit from the local area. During Spring 2014, 8 additional personnel, all of whom come from Norfolk, were added to the existing SSOWF team working out of Wells-next-the-Sea. These technicians will be led by a Manager who is a qualified electrical engineer from Fakenham, Norfolk. In addition to the technicians, 2 warehouse personnel were also appointed to support the O&M team with necessary management and distribution of tools and spare parts. Both team members came from Wells-next-the-Sea, Norfolk.

5.11.2. **On DB3, in preparation for the handover from the OEM (at a time to be determined) we will develop a skills plan. This will be produced in collaboration with key local stakeholders including Teesside Combined Authority and universities and training facilities in the area**.

5.12. Investment in Skills and Training

5.12.1. BOWL staff maintain a Personal Development Plan detailing short and long-term career goals. They are supported and kept up-to-date via online training tutorials and Skype webinars to reduce travel.

5.12.2. At GGOWL, around 100 new jobs were created at the £1.5 million O&M base in Lowestoft harbour, where approximately 95% of employees are from the local area. The Lowestoft fishing industry had been in decline due to a range of factors including fishing quotas. Windcat Workboats are used to transport the GGOWL technicians to and from Lowestoft to the OWF for maintenance activities. Windcat has employed many local former fishermen and has provided specialist offshore training to enable them to develop the different skill set required for stopping underneath a wind turbine.

5.12.3. SSOWF has been handed over from the OEM and the project has now taken on 2 apprentices, with a further 2 due to start in line with UK school years. **DB3 will build on the experience gained through the apprenticeship programme at SSOWF, and the SSE apprenticeship and engineering trainee schemes, to assess potential roles for apprentices and trainee engineers during the O&M phase**. **The project will put in place at least 2 apprenticeship roles on DB3 biennially during the O&M phase.**

5.12.4. During DB3's O&M phase we will make significant investment in skills development and training of staff. Due to the distance of the OWF from shore, we will have to ensure that there is the necessary competence offshore to deal with a range of maintenance tasks. The intention is to ensure that offshore technicians are multi-skilled so that they can carry out maintenance tasks on the HVDC transmission system as well as the day-to-day WTG work that they undertake. We **will employ turbine technicians then invest in training them to also carry out maintenance on the HVDC platforms**. This investment will ensure that we are better able to respond to unplanned maintenance tasks on the HVDC platform, thereby, reducing the risk of downtime.

[redacted]

5.12.6. Following the end of the SWA period, the operator will assume responsibility for O&M at DB3. A range of jobs will be available to support the project during this time (the length of which will depend on the duration of the SWA). There will be onshore roles comprising electrical, mechanical, logistical and facility support, and maintenance planning roles which **will be recruited by the operator who will provide on-the-job training for the relevant positions**. We expect these roles to be recruited in the local area. Given the low level of existing OWF operation activities in the North-East of England, we assess that it is unlikely that these specific OWF skills already exist in the required numbers in the region, so we anticipate significantly increasing local skills. Offshore roles will include WTG technicians, planners and logistics support, [redacted], etc. Initially, **the OEM will train the technicians. Following the OEM phase, the operator will take over responsibility for recruiting and training WTG engineering roles**. At this time, these roles are expected to be recruited from the UK. **The operator will actively review the local skills required for these roles and support the setup of such training facilities as are needed to support the development of any skills gaps**.

5.12.7. **Prior to the start of the O&M phase a skills strategy will be developed in coordination with the relevant Local Authorities.** The skills strategy will build on the work already in place within both SSE and Equinor and will be made specific to the job requirements and roles set out for DB3. **We will support the setup of local training provider supply chain where identified as required by the skills strategy or the utilisation of existing local training facilities.** This will reduce travel costs and time spent away from site (and therefore time away from the job).

5.13. Sharing best practice and lessons learnt

5.13.1. During the construction phase SSOWF had a dedicated paramedic on a CTV to support technicians working on turbines. In the O&M phase the team requires a 'first person on scene intermediate trained person' – a qualification greater than first aid but less than that of a paramedic. The KPI for this individual is for them to be in the nacelle within 30 mins of an incident occurring. Initially, one of the vessel crew was trained to perform this role; however, this has now been extended and the project is training all technicians to this level. The first person on scene approach has now been employed on the project and deployed successfully on training missions with enormous success. Similar lessons are expected to come out of other JV partner OWFs throughout the O&M phase and lessons learnt will be shared to ensure best practice is maintained.

5.13.2. Members of the DB3 team, and others within the JV parent companies, are active in a wide range of industry groups. **DB3 commits to ongoing sharing of best practice and lessons learnt through these groups as well as other relevant industry fora such as conferences, etc.**

6. Annexes

Annex 1 DB3 Map

[redacted]

[redacted]

Annex 4 Lesson Learnt Workshops

Annex 5 Open4 Business Introduction

Annex 6 Open4Business Presentation

Annex 7 BOWL Innovation Presentation to Scottish Renewables Conference

Annex 8 Aerial Inspections Case Study

Annex 9 Suction Bucket Trial Installation Case Study

Annex 10 Human Free Met Mast Installation Case Study

Annex 11 Practice Run Through Case Study

Annex 12 Cresto Smartline Presentation

[redacted]

Annex 14 Glossary

Endnotes

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