

Norfolk Vanguard Offshore Wind Farm

Appendix 31.2

Supply Chain Assessment

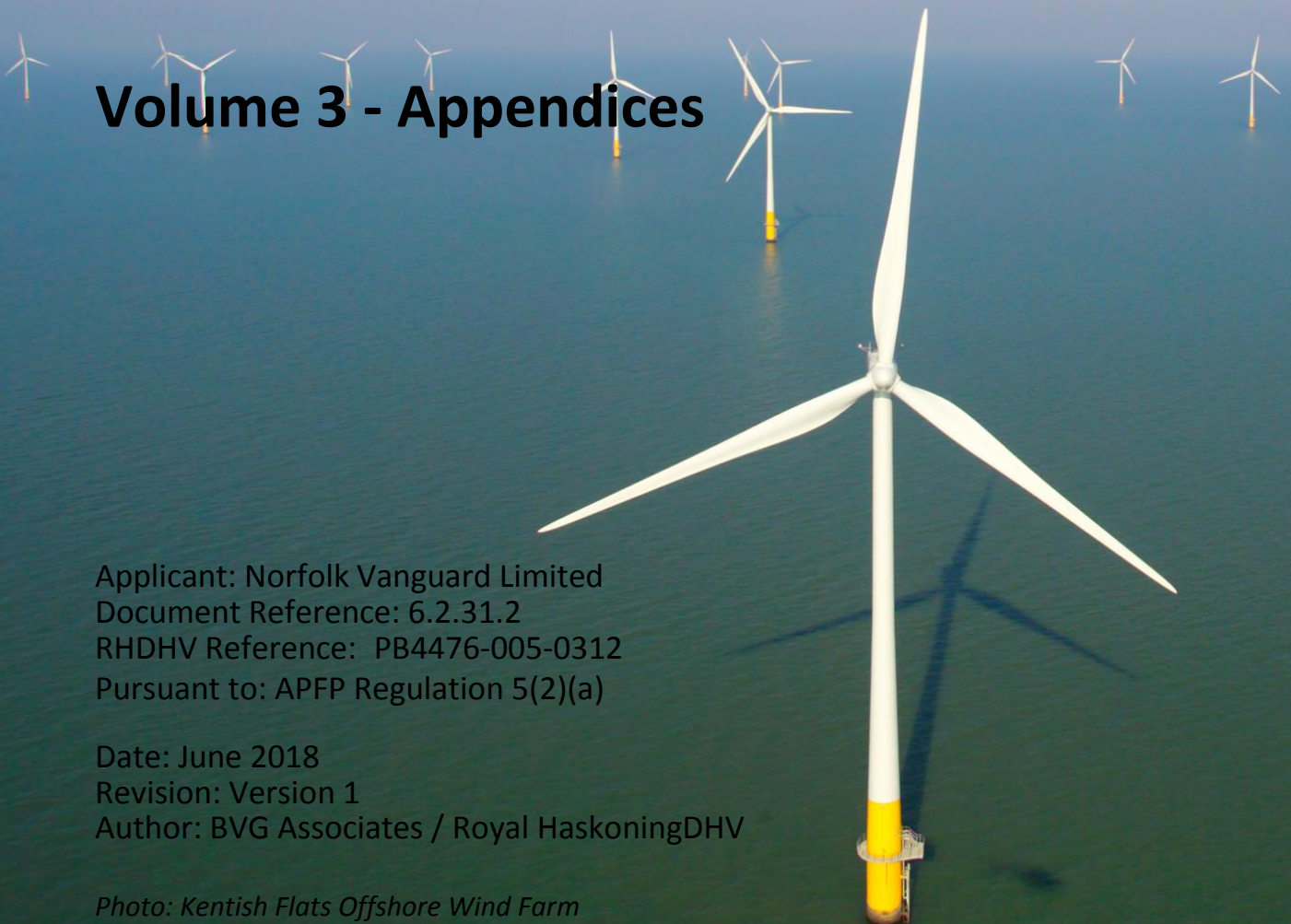
Environmental Statement

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Environmental Impact Assessment Environmental Statement

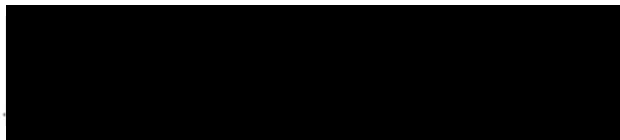
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For and on behalf of Norfolk Vanguard Limited

Approved by: Ruari Lean, Rebecca Sherwood

Signed:



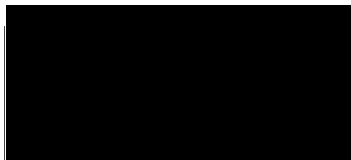
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Drafted by: Daniel Smith

Approved by: Alistair Davison

Signed:



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Glossary

AC	Alternating Current
DC	Direct Current
EPCI	Engineering, Procurement, Construction and Installation
ES	Environmental Statement
FEED	Front End Engineering Design
FTE	Full Time Equivalent

31 Supply chain assessment

31.1 Introduction

1. The supply chain assessment in Table 31.1 has been produced by Alun Roberts of BVG Associates on behalf of Royal HaskoningDHV for the Norfolk Vanguard Offshore Wind Farm (hereafter ‘the project’) Environmental Statement (ES). This report sits as Appendix 31.2 to Chapter 31 Socio-Economics and is based on BVG Associate’s experience in economic analysis of the UK offshore wind farm and their development of the UK Content method for RenewableUK.
2. The supply chain for the project has not been established at this stage of development. Therefore, the assessment is speculative and based on professional judgement of the UK offshore wind industry at time of writing rather than numerical modelling.
3. Probabilities have been assigned based on expected growth within the offshore wind market. However, investments and agreements that are not in the public domain may change this trend and cannot be accounted for. Therefore, there is a medium level of confidence in these probabilities.
4. Associated jobs are provided in Full Time Equivalent (FTE) Years. These differ from FTE in that they provide a figure for the entire stage of the project rather than an individual year. Figures for the construction phase are based on the period in the construction programme as per Chapter 5 Project Description (2020-2025). Figures in operation are based on a 30 year design life of the project.

Table 31.1 Supply Chain Assessment

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
Project management and development	Development studies	Development studies are typically undertaken by specialist consultancies. These will be in the same country as the wind farm but the location will depend on the location of offices and the suitably skilled individuals. Additional work will be undertaken by the developer	Low. There are no relevant consultancies in New Anglia Vattenfall Wind Power Limited undertakes this work outside New Anglia	Baseline Supply will almost certainly be from a UK supplier	About 100 direct FTE years About 300 indirect FTE years
	Surveys	Wildlife, geological and metocean surveys are undertaken by specialist data acquisition companies, typically using their own equipment. The companies may be based anywhere but are likely to be located close to hubs for other offshore sectors.	Medium. Fugro is a leading supplier and is based in Great Yarmouth	High Most contractors have a significant UK presence, even if they draw on skilled people from other parts of the company.	About 200 direct FTE years About 150 indirect FTE years
	Front End Engineering Design (FEED)	FEED studies may be undertaken partially in house but significant elements are subcontracted to engineering houses and in some cases tier 1 suppliers. Engineering houses tend to be located close to large metropolitan areas where they have easy access to skills	Low. Engineering houses have only a limited presence in New Anglia	High Most FEED is likely to be undertaken in the UK, with the possible exception of foundation design, which is highly specialist	About 150 direct FTE years About 100 indirect FTE years

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Project management and procurement	Project management and procurement is largely undertaken in house by the developer with some positions filled by sole traders or by contracts with companies.	Medium Preconstruction work is likely to be undertaken in the main project offices, often within corporate headquarters. Later, a construction office will be set up closer to the project.	High Most activity will take place in the UK, although some developers with a low UK footprint will draw on experienced individuals based overseas.	About 600 direct FTE years About 300 indirect FTE years
Turbine ex-works	Nacelle and hub	Nacelle and hub components are produced through a serial manufacturing process, as is assembly by the turbine manufacturer. The locations for this manufacture are based on long-term strategic decisions. Any new manufacturing facilities would only be built as a result of a new entrant to the market or if market growth meant that demand outstripped current capacity.	Low There is no supply of nacelle and hub components from New Anglia and this is unlikely to change for the foreseeable future.	Low There is very little UK supply of nacelle and hub components and this is unlikely to change for the foreseeable future.	About 2,000 direct FTE years About 6,000 indirect FTE years

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Blades	Nacelle and hub components are produced through a serial manufacturing process, usually in house by the turbine manufacturer. The locations for this manufacture are based on long-term strategic decisions. Any new manufacturing facilities would only be built as a result of a new entrant to the market or if market growth meant that demand outstripped current capacity.	Low There is no supply of turbine blades from New Anglia. There is some potential for composite material supply, such as resins, although these are global commodities.	High Both Siemens Games and MHI Vestas have UK blade manufacturing plants. Whether the blades for Norfolk Vanguard come from the UK will depend on how manufacturers meet demand from across Europe.	About 2,000 direct FTE years About 1,500 indirect FTE years
	Tower	Towers are manufactured by specialist third parties. It is a volatile market because the low margins have meant that company failures are relatively frequent.	Low There is no New Anglia supply of towers, although there is a theoretical opportunity in the supply of internal ladders and platforms. There a possibility that there may be new UK investment in a tower factory before 2025 but there are no particular reasons why it would be in New Anglia.	Medium There is a single UK tower factory in Campbeltown, Scotland, owned by CS Wind UK. Some turbine manufacturers may prefer UK towers to meet political pressure for local content. Given the uncertain past of the Campbeltown factory, it is difficult to speculate whether it could supply towers to Norfolk Vanguard	About 400 direct FTE years About 1,000 indirect FTE years

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
Balance of plant	Foundations	It is assumed that Norfolk Vanguard will use jacket foundations. The market has matured and successful suppliers are typically those that have invested in serial manufacturing facilities. New investments are possible with the use of jackets likely to increase over the next decade.	Low There is no New Anglian supply of jacket foundations. Although the region has a track record in fabrication for the oil and gas industry, it is not clear that it would be a favoured location for future investments.	Medium Jacket foundations have long been considered an opportunity for the UK supply chain. Despite this, UK suppliers have not generally been competitive and in the longer term, UK supply is most likely to come from inward investment by the leading suppliers that wish to increase their capacity and offer greater UK content.	About 1,500 direct FTE years About 800 indirect FTE years
	Subsea cables	Subsea cable factories have typically been built to meet specific demand from interconnector projects, and several are in the Scandinavian and Baltic areas for this reason. Manufacturers have typically chosen to expand these factories to meet demand for offshore wind rather than invest at new sites.	Low JDR Cables has its headquarters in Cambridgeshire, although its subsea cable plant is in Hartlepool.	Medium JDR Cables has been one of the leading developers of 66kV array cables, which are likely to be the industry standard in 2025. There is a therefore a reasonable chance of UK content.	About 2,000 direct FTE years About 1,500 indirect FTE years

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Transmission electrical	High and medium voltage electrical components are typically manufactured by global conglomerates at plants with the capacity to meet regional demand. Engineering and project management is typically undertaken in the relevant market country, with input from other locations as needed.	Low There are no known suppliers of electrical equipment in New Anglia	Medium Engineering and project management is highly likely to be in the UK. GE has the only significant manufacturing capacity in the UK, covering high voltage transformers and converters.	About 1,000 direct FTE years About 1,500 indirect FTE years

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Transmission structural	<p>Offshore platforms and their foundations are generally manufactured by companies with yards that have met demand from oil and gas and shipyards.</p> <p>The current generation of HVDC platforms are larger than most yards can accommodate and this may encourage new entrants to the market that have suitable infrastructure.</p> <p>Platform foundations are often supplied by a third party.</p> <p>Platform manufacturers have a significant supply chain, which are typically clustered around coastal infrastructure to meet demand from other offshore sectors.</p>	<p>Low</p> <p>Sembmarine SLP in Lowestoft has a track record in supplying substations but it is only one of a number of suppliers across Europe and the sector is highly competitive. HVDC technology is developing but it is unclear whether current developments to shrink DC converter platforms will have progressed sufficiently by 2025 for the company to be a viable supplier. It could be better placed to win the foundations contract.</p>	<p>Low</p> <p>Several UK yards have supplied Alternating Current (AC) platforms to the offshore wind market.</p> <p>The dimensions of Direct Current (DC) platforms are such that it is debatable whether a UK supplier could construct a platform without investment</p>	<p>About 2,000 direct FTE years</p> <p>About 1,500 indirect FTE years</p>

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
Installation and commissioning	Foundation installation	<p>Foundation installation has been undertaken using a jack-up vessel or a floating heavy lift vessel. These jack-ups have typically been used for both turbine and foundation installation but in the future the high mass of foundations and the high hub height of turbines will mean that the fleets becoming increasingly distinct.</p> <p>Most contractors are based in Europe and they are a mixture of specialist vessel operators and larger Engineering, Procurement, Construction and Installation (EPCI) contractors.</p> <p>Installers have a significant supply chain, notably for mobilisation and demobilisation services, sea fastening fabrication, staging port facilities and crewing services.</p>	<p>Low</p> <p>Great Yarmouth Seajacks operates the largest jack-up vessel currently in operation, which is well suited to large monopole installation. The trend towards large floating heavy lift vessels for foundation installation would erode Seajacks' competitiveness without further investment.</p> <p>New Anglia has a number of relevant companies at tier 2 level.</p>	<p>Low</p> <p>There has been significant consolidation in the foundation installation market that is a threat to existing UK capability.</p> <p>Lower tier opportunities for UK companies could increase, particularly if overseas contractors seek opportunities to increase local content.</p>	<p>About 1,200 direct FTE years</p> <p>About 700 indirect FTE years</p>

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Cable installation	<p>Cable installation is provided by EPCI contractors, a small number of specialist operators and cable manufacturers that have their own vessels.</p> <p>The work is increasingly being undertaken using newbuild vessels designed specifically for offshore wind.</p> <p>There is a significant supply chain for installers, including route clearance, remotely operated vehicles, crewing services, cable storage and handling equipment and services, vessel mobilisation and demobilisation, and electrical services.</p>	<p>Low</p> <p>There are no installers based in New Anglia.</p> <p>There is no significant relevant supply chain.</p>	<p>Medium</p> <p>The UK is likely retain some cable laying capability to 2025. It has a strong supply chain and this is likely to be retained.</p>	<p>About 2,000 direct FTE years</p> <p>About 1,500 indirect FTE years</p>
	Turbine installation	<p>The increasing size of turbines, and particularly the hub height, will put pressure on the competitiveness of the vessel fleet unless there is significant investment and/or radical innovation in installation technology.</p> <p>Increasing turbine supply also shrinks the vessel market per MW because the MW carrying capacity for a vessel typically increases with larger turbines.</p> <p>(Note: Increased turbine size also shrinks the foundation and cable installation market for similar reasons.)</p>	<p>Medium</p> <p>Great Yarmouth Seajacks operates the largest jack-up vessel currently in operation, which is may be well suited to turbine installation, possibly with some modification.</p>	<p>Medium</p> <p>See Probability of New Anglia supply.</p>	<p>About 1,000 direct FTE years</p> <p>About 500 indirect FTE years</p>

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Substation installation	Substation platform installation is generally undertaken by a floating heavy lift vessel, often with a single lift from a barge. The low volume of work typically means that the operation often uses vessels used in other sectors. Self-installing substations have been developed. The substation foundation installation is a similar process to turbine foundation installation and may be undertaken by the same contractor	Low New Anglia has no relevant capability.	Low The UK has no relevant capability.	About 200 direct FTE years About 100 indirect FTE years
Operations, maintenance and service	Wind farm operations	Wind farm operations is split between day-to-day activities directly concerned with the specific wind farm and asset management functions that may cover a number of wind farms. Day-to-day functions for Norfolk Vanguard are likely to be undertaken from an offshore base, either a service operation vessel (SOV) or a fixed platform. Asset management functions may be UK and/or internationally based.	High Although SOV operations do not require a very local base, with crew and supply changes perhaps every two weeks, onshore activity is likely to be focused in New Anglia.	High See Probability of New Anglia supply.	About 2,500 direct FTE years About 1,000 indirect FTE years

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Turbine maintenance and service	<p>Turbine maintenance and service is divided into:</p> <p>Planned service and regular maintenance that can be undertaken using the equipment and workforce dedicated to the wind farm</p> <p>Major service, typically involving replacement of major components using jack-up vessels.</p> <p>Work may be undertaken by the turbine manufacturer or third party service provider, or by in house by the wind farm owner, bringing in additional technicians as needed to meet peaks in demand.</p>	<p>High</p> <p>Planned service and regular maintenance is likely to be largely focused in New Anglia, even if much of the activity is based offshore in SOVs or fixed platforms.</p> <p>For major service, components and vessels will probably be bought in from outside the region.</p>	<p>High</p> <p>See Probability of New Anglia supply.</p>	<p>About 2,500 direct FTE years</p> <p>About 1,000 indirect FTE years</p>

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Balance of plant maintenance	<p>Balance of plant covers:</p> <p>Cable maintenance, replacement and repair</p> <p>Foundation, inspection and remedial works</p> <p>Substation maintenance (on and offshore)</p> <p>Export cables are substations will be owned by the offshore transmission owner. Array cables and foundations fall within the remit of the wind farm owners.</p> <p>Balance of plant maintenance is typically infrequent and therefore contractors can be widely dispersed and not necessarily close to offshore wind farms.</p>	<p>Medium</p> <p>Although, balance of plant maintenance contractors may be widely dispersed across Europe, many have built up expertise in the oil and gas sector. New Anglia's heritage in this sector and the potential for a clustering effect to meet the needs of the whole New Anglia offshore wind zone means businesses there are likely to be successful.</p>	<p>High</p> <p>There is competition from mainland Europe but UK companies should perform strongly.</p>	<p>About 500 direct FTE years</p> <p>About 200 indirect FTE years</p>
Decommissioning	Engineering and project management	<p>Offshore wind decommissioning has so far only been undertaken for small numbers of turbines. It is likely that the decommissioning engineering and project management will be undertaken using the same model as project management and development phase. There is a good chance that a large project such as Norfolk Vanguard would be repowered.</p>	<p>Low</p> <p>Much of the work will be taken in the corporate offices of wind farm owners and within engineering consultancies. These are unlikely to be based in New Anglia.</p>	<p>High</p> <p>The wind farm owner is likely to the work in UK offices. Engineering work is also likely to be done by UK based consultancies.</p>	<p>About 200 direct FTE years</p> <p>About 100 indirect FTE years</p>

Element	Sub-element	Commentary	Probability of New Anglia supply	Probability of UK supply	Associated jobs
	Offshore works	The specific nature of the work is uncertain but it is likely to involve the same contractors as for installation (although after decades of operation, their identities will have changed in many cases).	Low The work will be undertaken by one of a number of contractors from across Europe.	Medium UK is likely to have competitive contractors but they will probably be up against other European contractors with cost the likely differentiator.	About 1,500 direct FTE years About 500 indirect FTE years
	Salvage and recycling	Salvage of steel offshore structures is a well established process. Recycling of turbine blades was not developed far but there are likely to be solutions at the end of Norfolk Vanguard's life. Given the volume of work from the mid-2030s onwards, specialist offshore wind salvage ports may develop.	Medium New Anglian ports could be used but much could depend on whether there were suitable facilities for salvage.	High Salvage and recycling of ships and offshore structures already takes place in the UK and it could be an attractive opportunity for port owners.	About 500 direct FTE years About 300 indirect FTE years

31.1.1 Disclaimer

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