Norfolk Boreas Offshore Wind Farm

Chapter 2

Need for the Project

Environmental Statement

Volume 1

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Glossary of Acronyms

BEIS	Department for Business, Energy and Industrial Strategy
CCC	Committee on Climate Change
CEBR	Centre for Economics and Business Research
CfD	Contract for Difference
COP	Conference of the Parties
CO_2	Carbon dioxide
DECC	Department of Energy and Climate Change (now BEIS)
EU	European Union
GDP	Gross Domestic Product
GW	Gigawatt
IPCC	Intergovernmental Panel on Climate Change
MW	Megawatt
MWh	Megawatt hour(s)
NOAA	National Oceanic and Atmospheric Administration
NPS	National Policy Statement
New Anglia LEP	New Anglia Local Enterprise Partnership for Norfolk and Suffolk
TWh	Terawatt hour(s)
TCE	The Crown Estate
UK	United Kingdom

Glossary of Terminology

The Project	Norfolk Boreas Wind Farm including the onshore and offshore infrastructure.
Decarbonisation	The reduction or removal of carbon dioxide from energy sources
Contracts for Difference (CfD)	This scheme is the UK government's main mechanism for supporting low-carbon electricity generation.

2 NEED FOR THE PROJECT

2.1 Introduction

1. This chapter presents the importance of offshore wind energy and the need for the Norfolk Boreas Offshore Wind Farm (herein 'Norfolk Boreas or 'the project'), in meeting global, European Union (EU) and United Kingdom (UK) policy commitments for renewable energy and wider policy objectives for UK energy security, decarbonisation and economic growth. Further detail on the relevant UK commitments and the policy and legislation designed to implement them is discussed in Chapter 3 Policy and Legislative Context.

2. The UK requires a range of energy generation infrastructure in order to ensure it has a secure and affordable energy supply and can meet its binding commitments to addressing climate change and to the adoption of renewable technologies as a significant proportion (15% by 2020) of its energy generation mix. The Clean Growth Strategy (Department for Business, Energy & Industrial Strategy (BEIS), 2017) sets out how the government intends to invest in clean growth technology between 2015 and 2021 including innovation in the power sector (including renewables). Additionally, in March 2018 the UK offshore wind sector committed to an "Offshore Wind Sector Deal" (BEIS, 2019) which reinforces the aims of the government's Industrial Strategy to drive the transformation of offshore wind generation, making it an integral part of a low-cost, low-carbon, flexible grid system and boost the productivity and competitiveness of the UK supply chain. These ambitions are to be realised through an industry investment into the Offshore Wind Growth Partnership of up to £250m to support better, high-paying jobs right across the UK. (BEIS, 2019).

3. The Sector Deal states that, subject to costs coming down, this commitment could see offshore wind contributing up to 30 Gigawatts (GW) of generating capacity by 2030 (BEIS, 2019).

4. The 2030 vision is for an investment of £48 billion in UK offshore wind infrastructure.

5. Offshore wind, as a source of renewable energy, offers the UK a wide range of benefits from an economic growth, energy security and decarbonisation perspective. Norfolk Boreas has the potential to make a significant contribution to renewable energy supply and consequently help provide these benefits to the UK and globally. The strategic development of Norfolk Vanguard (the sister project to Norfolk Boreas) by Vattenfall Wind Power Limited (VWPL) as well as Norfolk Boreas (see Chapter 5 Project Description) would further increase this contribution to UK energy supply and help fulfil future increasing demand for renewable energy.

2.2 The Need for Renewable Energy

6. The key drivers underpinning the need for renewable energy are:

- The need to reduce greenhouse gas emissions, including increasing energy generation from low carbon sources to replace high carbon energy sources such as burning coal and gas;
- The need for energy security, including:
  - The need to secure safe, affordable, reliable energy, preferably generated in the UK for the UK market;
  - The need to replace existing ageing energy generation infrastructure; and
  - The need to meet expected electricity demand whilst meeting climate change commitments; and
- The need to maximise social and economic opportunities for the UK from energy infrastructure investment, as noted in the Clean Growth Strategy (BEIS, 2017) and the UK offshore wind Sector Deal (BEIS, 2019).

2.2.1 The Need to Address Climate Change and Reduce Greenhouse Gas Emissions

7. In the Overarching National Policy Statement (NPS) for Energy (Department of Energy and Climate Change (DECC), (2011), predictions are made that a continuation of global emission trends, including emissions of greenhouse gases such as carbon dioxide, could lead average global temperatures to rise by up to 6°C by the end of this century. The potential impacts associated with such a global temperature rise include (DECC, 2014):

- Increased frequency of extreme weather events such as floods and drought;
- Reduced food supplies;
- Impacts on human health;
- Increased poverty; and
- Ecosystem impacts, including species extinction.

8. The UK Committee on Climate Change (CCC)[1] (2018) reported that 2017 was in the top three warmest years on record. This followed 2016 which was the hottest year on record and was the fifth time in the 21st century a new record high annual temperature has been set (along with 2005, 2010, 2014, 2015) (National Oceanic and Atmospheric Administration (NOAA), 2016).

9. A commitment by the UK was made during the 21st Conference of the Parties (COP) in Paris in 2015 to pursue efforts to limit the global temperature increase to within

[1] The Committee on Climate Change is an independent, statutory body established to advise the UK Government on emissions targets and report on progress made in reducing greenhouse gas emissions and preparing for climate change.

2°C of the pre-industrial average temperature, with an aspiration for an improved limit of 1.5°C. During the December 2018 COP24 a set of rules to govern the Paris accord were agreed.

10. The Intergovernmental Panel on Climate Change (IPCC) have however warned that if the global temperature rise is not limited to 1.5°C there could be severe consequences. In their "Special Report" published in October 2018 (IPCC, 2018) it is predicated that a 2°C rather than a 1.5°C would significantly worsen the risks of drought, floods, extreme heat and poverty for hundreds of millions of people.

11. In their latest progress report to UK Parliament (June, 2018) the CCC quoted: "An 80% reduction in emissions [Which the UK are committed to under the Climate Change Act] has always implied the need for new national infrastructure" and "The deeper emissions reductions implied by the Paris Agreement make these developments even more important" (CCC, 2018).

12. Power sector emissions fell 11% in 2017, this has contributed to a reduction in greenhouse gas emissions of 5% in 2016 for the UK as a whole, following an average annual decrease of 3.1% in the years between 2009 and 2016 (CCC, 2018). This reduction is largely due to an increase in renewable and nuclear generation, equating to almost half of the UK's electricity demand in 2015 (CCC, 2016a). However, in order to achieve necessary ongoing reductions in emissions, the CCC recommended that the UK government should set out an intention to support 1-2GW of new offshore wind per year, provided costs continue to fall, with a view to phasing out subsidies in the 2020s (CCC, 2015a). The EU and UK legislation that has been put in place to secure a reduction in emissions is outlined in Chapter 3 Policy and Legislative Context.

13. Norfolk Boreas and Norfolk Vanguard together have the potential, at today's level of UK carbon emissions from the power sector, to prevent more than 4,000,000 tonnes of Carbon dioxide (CO_2) per year from entering the atmosphere.

14. Climate change is known to be greatly affecting coastal areas, including in Norfolk, where coastal erosion has become a increasing problem (insert a suitable reference). This is due to a combination of increasing storm frequency (due in part to climate change) and the already sensitive nature of the Norfolk Coast to this erosion. As such, Norfolk itself will benefit from any efforts to reduce the UK's reliance on fossil fuel based electricity production. The Norfolk Boreas offshore wind farm would significantly increase the contribution of Norfolk as part of a global solution to a problem which directly impacts the county.

2.2.1.1 The role of offshore wind

15. The UK CCC, in its advice on the Fifth Carbon Budget, identified that the amount of renewable electricity generated in the UK must double by 2030 if it is to meet its legally-binding climate change targets. The role of offshore wind in delivering this additional capacity of low carbon energy is highlighted by the committee reports, which also recognises that the offshore wind sector is now maturing and showing very significant cost reductions (see section 2.3.1).

16. A dataset produced by the CCC (2016) calculated cumulative deployment figures (Terawatt hours (TWh)/year) for different forms of electricity generation in the UK from 2015 through to 2030. For offshore wind, the fifth carbon budget target for 2020 is 36.6TWh/year which doubles in 10 years to 72.4TWh/year for 2030. Calculations show that Norfolk Boreas will generate approximately 7.0TWh/year using the calculation below:

1800MW x 8760h/year x 50% capacity factor[2] x 90% availability[3]

17. Therefore, with a total maximum export capacity of 1,800 Megawatts (MW), Norfolk Boreas alone has the potential to contribute nearly 10% to the UK cumulative deployment figure for 2030. If considering Norfolk Vanguard alongside this with a further capacity of 1,800MW, this would equate to almost 20% of the UK cumulative deployment figure for 2030 being fulfilled by the two projects.

2.2.2 The Need for Energy Security

18. The UK has been a net importer of electricity since 2010 and imported around 36% of the energy used in the UK in 2017 (BEIS, 2018a).

19. Key issues associated with energy security in the UK are:

- The decline in fossil fuel reserves (in particular North Sea oil and gas);
- The required ongoing closure and decommissioning of existing aging fossil fuel and nuclear electricity generating infrastructure; and
- The need for replacement sources.

20. Many of the UK's older fossil fuel and nuclear plants have either reached the end of their operational life span, are no longer economical to run, and/or do not meet legal air quality limits. The UK Energy Security Strategy estimated that around a fifth of the energy capacity available in 2011 will close by 2020 (DECC, 2012).

[2] Capacity factor is the ratio of actual energy produced by the turbine to the maximum capacity of the turbine
[3] Availability is the ability of the wind farm, as a whole, to generate power, given appropriate weather and grid conditions. It is a percentage to account for loss of energy associated with the amount of time that the turbines are unable to produce electricity.

21. The Clean Growth Strategy (BEIS, 2017) states that the UK Government will continue to invest in electrification of transport, heating and industry. The demands on the UK's energy infrastructure will change as low carbon heating technologies take over from fossil fuels, with a greater dependence on electricity and a potential need for new infrastructure for system balancing and the generation of low carbon gases (BEIS, 2017). The NPS for Energy (EN-1) estimates that additional electricity generating infrastructure to ensure adequate supplies will require net new capacity of approximately 59GW by 2025, of which up to 33GW will need to be from renewable sources (DECC, 2011). The electricity generated by renewables reached a capacity of 18.3GW (derated to reflect intermittency), accounting for 22 per cent of UK generating capacity (BEIS, 2018a).

22. Reliance on global markets for imported energy leaves the UK vulnerable to spikes in world energy market prices, political pressure and potentially physical supply disruptions. The DECC Energy Security Strategy (2012) outlines the approach to ensuring that consumers have access to energy to meet their demand, and security requirements at prices which are resilient to volatile prices such as those experienced for fossil fuels (price security).

23. The CCC identifies the amount of energy capacity that will be needed to fill the future predicted generation gaps, taking into consideration retirement of high-carbon energy sources and some nuclear sources.

24. If there was no growth in demand during the 2020s, around 25GW of new electricity capacity would be needed, however as demand grows, more capacity will be needed. CCC suggests that if demand grows by 23% (as in the CCC central scenario for demand growth), a total of 40GW of de-rated electricity capacity would be needed (CCC, 2015b).

2.2.3 The Need to Maximise Economic Opportunities

25. The UK is able to continue growth in the offshore wind sector by maximising domestic energy resources and utilising the vast offshore wind resource to which the UK has access. An assessment by WindEurope in June 2017 of Europe's offshore wind resources found that the UK has the greatest potential for offshore wind out of all assessed EU member states in the Atlantic, North Sea and Baltic Sea areas and at present, has the largest installed capacity in the world. The assessment looked at gross resource potential, technical resource potential and economically attractive resource potential, and found that the UK topped all other countries in all three categories (WindEurope, 2017).

26. A key commitment within the Green Paper: Building our Industrial Strategy (UK Government, 2017) is to "*lead the world in delivering clean energy technology*" and

to support innovation in this area. The aim is for "*the UK to be a global leader in innovation, science and research and our Industrial Strategy will help us to deliver our ambitious CO_2 reduction targets while, creating jobs and opportunities for people across the country*". The energy sector in the UK plays a central role in the economy and renewable energy can play a major part in boosting the economy and providing new jobs and skills.

27. The Centre for Economics and Business Research (CEBR, 2012) estimates that by 2030, offshore wind could increase the UK's Gross Domestic Product (GDP) value by 0.6% and support 173,000 jobs. The UK Government's Clean Growth Strategy (BEIS, 2017) concludes that between 1990 and 2016, the UK reduced its emissions by 42% while the economy grew by 67%. Further analysis has concluded that continuing to develop on this, significant economic benefits can be captured from these decarbonising trends. By taking no action, the UK economy could miss out on a potential low carbon economy growth of 11% per year between 2015 and 2030 (four times faster than the average 2.7% growth rate in UK GDP) (BEIS, 2017).

28. During Greg Clark's (Secretary of State for Business, Energy and Industrial Strategy) speech at Energy UK in November 2016, he made clear that "*the debate about whether to reduce emissions is over*" and that there is "*huge economic opportunity of climate change action for UK businesses*". The speech also particularly referenced the east coast of England as an area where the offshore wind industry is contributing, and will continue to contribute, to the local economy.

29. The UK has a strong supply chain for offshore wind. The Green Paper: Building our Industrial Strategy (UK Government, 2017) focusses on delivering affordable energy and green growth. The offshore wind supply chain, for example the Siemens' factory in Hull, plays a key role in delivering this growth strategy.

30. According to the 2017 Report on Offshore Wind UK Content (RenewableUK, 2017), 48% of the total expenditure associated with UK offshore wind farms was spent in the UK in 2015. The UK content of expenditure during the development stage and operation of offshore wind projects was 73% and 75% respectively in 2015, whereas during manufacturing and construction the UK content was 29% (RenewableUK, 2017).

31. The offshore wind industry present significant employment opportunities (Whitmarsh et al, 2019) to utilise and further develop the UK's maritime engineering skills, particularly during a time when other industries are in decline (such as shipbuilding and North Sea oil), in order to secure supply chain and other employment opportunities in the UK. As offshore wind supply chains are developing mainly in areas of low economic productivity, which have significant socio-economic challenges, the benefit to local communities and businesses is very important. The

replacement of existing infrastructure with new technologies also represents significant investment in the UK economy.

"Offshore wind has become a key part of the UK economy, creating much-needed jobs not only in coastal communities like Hull, Grimsby and Great Yarmouth, but also across the country in the ever-expanding supply chain. A huge number of British companies are heavily involved in building the UK's world-leading offshore wind sector." (RenewableUK, 2017).

32. Organisations such as The Crown Estate (TCE) are facilitating new companies to enter into the offshore wind supply chain. The TCE have recently published a "Guide to Offshore Wind Farm Business" to help a range of stakeholders and potential new market entrants understand how an offshore wind farm is built, operated and maintained (TCE, 2019). The recently published "Norfolk and Suffolk Offshore Wind Cluster" brochure by the New Anglia Local Enterprise Partnership (LEP) (2019) also depicts how the opportunities presented by the Offshore Wind Sector Deal have stimulated local partnerships to develop a collective vision for the future.

"The flourishing offshore wind cluster in the region is establishing itself as the centre of gravity for the UK's offshore wind market with more installed capacity than any other UK region." (New Anglia LEP, 2019)

33. The aim of New Anglia LEP is to lead economic growth and job creation in these areas by 2026 (New Anglia LEP, 2017).

2.3 Benefits of Offshore Wind Energy

34. The UK is well placed to lead the deployment of offshore wind with an estimated 40% of the total 2020 projected European offshore wind generation capacity (Green Alliance, 2014; Wind Europe, 2016), and over a third of the total European potential offshore wind resource (Energy Technologies Institute, 2013) making it one of the most globally attractive locations.

35. The key benefits of offshore wind energy as a contributor to the renewable energy mix are as follows:

- Diversification and security of home-grown energy generation capacity which makes use of an abundant source of energy;
- A technology with potential to make significant and rapid contributions to the national renewable energy targets;
- Economic development and job creation, both within the UK and further afield within the supply chain; and
- Very low lifetime CO_2 emissions per unit of electricity generated.

36. Currently there are around 7.9GW (RenewableUK, undated) of operational offshore wind capacity in UK waters, making the UK a world leader in offshore wind energy. In addition, a further 27.34GW of capacity is either under construction, has government support, has been consented, or is in the Planning system (Renewable UK, 2018b).

37. The continued development of offshore wind within the UK is therefore seen as critical to ensuring that the UK and Europe are able to meet their binding energy and climate change targets.

2.3.1 Cost of Offshore Wind

38. Energy from offshore wind has previously been considered as being an expensive alternative to more conventional forms of energy generation such as coal, gas and nuclear.

39. However, the results of the latest Contract for Difference[4] (CfD) auctions announced on the 11th September 2017, showed an unexpected dramatic fall in the cost of offshore wind for projects which will be realised over the next several years. The cost of offshore wind, as measured by the CfD auction prices, has reduced by almost 50% (from £105 to £57.50/MWh) in 2 years, making offshore wind one of the most attractive and cost-effective methods of generating large quantities of low carbon energy (OWIC, 2018). Norfolk Boreas Limited is committed to ensuring that the design of Norfolk Boreas will allow it to provide a low cost of energy.

40. The Clean Growth Strategy (BEIS, 2017) gives a strong commitment from government to achieving the UK's already agreed climate change goals. With reference to offshore wind the Strategy notes the rapid cost reductions in the cost of energy from offshore wind and commits to up to £557million of CfD support that will deliver between 1 to 2GW of offshore wind each year in the 2020s, with an auction scheduled for spring 2019.

2.4 Norfolk Boreas' Contribution to Meeting Targets

41. If built, Norfolk Boreas would have a design life of approximately 30 years, after which it may be repowered (subject to separate consenting). During its operation, the project would contribute to reaching global, European and national targets on CO_2 reduction and renewable energy production.

42. In line with the Kyoto Protocol (see Chapter 3 Policy and Legislative Context), signatory states, including the UK, have developed national targets for energy generation from renewable sources. Additionally, as part of the Paris 2015

[4] The Contracts for Difference (CfD) scheme is the UK government's main mechanism for supporting low-carbon electricity generation.

Commitments, the EU pledged (as the UK is still an EU member at the time of writing, the UK is part of this pledge) to have at least a 40% domestic reduction in greenhouse gases by 2030 (compared to 1990 levels) (European Commission, 2017) and Norfolk Boreas would contribute towards these targets.

43. European energy policy (see Chapter 3 Policy and Legislative Context) recognises that the use of renewable energy contributes significantly to limiting climate change, and plays a part in securing energy supply and creating employment.

44. Targets for reduced greenhouse gas emissions and the use of renewable energy have been translated in UK policy and legislation (see Chapter 3 Policy and Legislative Context) through the UK Climate Change Act. This has contributed to the incentive to establish the former East Anglia Zone and subsequently, Norfolk Boreas.

2.5 Summary – The Need for Norfolk Boreas

45. One of the key drivers of the policies and government initiatives which support the development of renewable energy in the UK, Europe and further afield, is the recognition of the need to transition to low carbon economies. The generation of utility-scale quantities of electricity from renewable energy sources can have a direct and measurable effect on climate change and in meeting the UK's climate change and emissions reduction targets.

46. Norfolk Boreas would be one of the biggest offshore wind projects in the world and make a large contribution to the achievement of the national renewable energy targets (see section 2.2) and to the UK's contribution to global efforts to reduce the effects of climate change.

47. Norfolk Boreas and Norfolk Vanguard together have the potential, at today's level of UK carbon emissions from the power sector, to prevent more than 4,000,000 tonnes CO_2 per year from entering the atmosphere.

48. Moreover, Norfolk Boreas would have a direct positive impact by providing up to 1,800MW of renewable energy, securing supply for nearly 2 million UK households[5]. This is greater than 2% of the UK's annual energy demand, or 25% of the East of England's electricity demand (domestic, commercial and industrial).

49. The project would reduce carbon emissions and contribute to the economy by providing jobs during all phases of the proposed project. In addition, Norfolk Boreas Limited is committed to bringing down the cost of offshore wind, with the aim of making Norfolk Boreas one of the lowest cost sources of new power generation when operational.

[5] Based on a load factor of 47.3% which is advocated by BEIS for new offshore wind farm projects (BEIS, 2018) and RenewableUK www.renewableuk.com/page/UKWEDExplained

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