East Anglia ONE North Offshore Windfarms

Habitat Regulations Assessment Derogation Case – D6 Update

Applicant: East Anglia ONE North Limited
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Applicable to East Anglia ONE North

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01	n/a	n/a	Final for submission
01	n/a	n/a	Updated to address Examining Authority's second written questions at Examination Deadline 6

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Glossary of Acronyms

AA	Appropriate assessment
AEOI	Adverse effect on integrity
AMEP	Able Marine Energy Park
BEIS	Department for Business, Energy and Industry Strategy
CCC	UK's Committee on Climate Change
CfD	Contracts for Difference
COP	Conference of Parties
CO2	Carbon dioxide
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food & Rural Affairs
EATL	East Anglia THREE Ltd
EC	European Commission
ES	Environmental Statement
EU	European Union
EIA	Environmental Impact Assessment
ExA	Examining Authority
FFC SPA	Flamborough & Filey Coast Special Protection Area
GB	Great Britain
GW	Gigawatt
HRA	Habitat Regulations Assessment
IPCC	Intergovernmental Panel on Climate Change
IROPI	Imperative reasons of overriding public interest
ISAA	Information to Support Appropriate Assessment
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
MMO	Marine Management Organisation
MHWS	Mean High Water Spring
MPA	Marine Protected Area
MU	Management Unit
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NS	North Sea
O&M	Operations and Maintenance
PINS	Planning Inspectorate
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SG	Scottish Government
SNCB	Statutory Nature Conservation Body
SoS	Secretary of State
SPA	Special Protection Area
SPR	Scottish Power Renewables (UK) Limited
TCE	The Crown Estate

TWh	Terawatt-hour
UK	United Kingdom of Great Britain and Northern Ireland
ZAP	Zone Appraisal and Planning
ZTA	Zonal Technical Appraisal
ZEA	Zonal Environmental Appraisal

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one offshore construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
East Anglia Zone	The broader area defined for Round 3 applications within which the East Anglia ONE North windfarm site is located together with East Anglia One, East Anglia THREE, East Anglia TWO, Norfolk Boreas and Norfolk Vanguard.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Habitats Directive	European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora
Habitats Regulations	The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017
HRA	Habitat Regulations Assessment is a recognised step by step process which helps determine likely significant effect and (where appropriate) assesses any adverse effects on the integrity of Natura 2000 sites protected under the Birds or Habitats Directives
Likely Significant Effect	Checking for the likelihood of significant effects on Natura sites is a part of HRA. Unless a significant effect can be ruled out, it is considered 'likely' and requires appraisal.
Natura 2000 site	A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.

1 Introduction

1.1 Purpose of this document

1. East Anglia ONE North offshore windfarm [PINS reference EN010077] (the Project) applied on 25th of October 2019 for an order granting development consent under the Planning Act 2008 (the Application) to authorise the construction, operation and maintenance of the East Anglia ONE North windfarm generating station in the Southern North Sea, with associated offshore and onshore infrastructure.

2. The Application was accepted by the Planning Inspectorate ("PINS") on behalf of the Secretary of State for Business, Energy and Industrial Strategy (the Secretary of State) on 22nd of November 2019 and is subject to examination by the appointed Examining Authority (ExA) between 6th October 2020 and 6th April 2021 (the Examination).

3. In the ExA's Rule 6 letter of the 16th July 2020 the ExA asked East Anglia ONE North Limited (The Applicant) under Procedural Decision 18, Question 2 to consider whether:

   "there is a need for the project before us to……. engage with the derogation tests set out under stages 3 and 4 of the Habitats Directives and Regulations"

4. This document therefore presents information on the provisions of article 6(4) of the Habitats Directive[1], and sets out a derogation case that demonstrates that there are no alternative solutions that avoid adverse effect on integrity (AEoI), that there are imperative reasons of overriding public interest (IROPI) for the Project and that compensatory measures can be secured should it not be possible to rule out AEoI from effects of the Project. This document is an update of the previous version (REP3-053) taking into account comments from the ExA in their written questions and requests for information (ExQs2, issued 12th February 2021).

5. This question has been considered in relation to the sites and features listed in ***Table 1.1***.

Table 1.1 European sites and features

European Site	Qualifying feature	Relevant impact from Project
Flamborough and Filey Coast Special Protection Area	Kittiwake Gannet	In-combination collision risk

[1] EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

European Site	Qualifying feature	Relevant impact from Project
	Razorbill Guillemot	In-combination displacement
Outer Thames Estuary Special Protection Area	Red throated diver	Project alone displacement risk In-combination displacement risk
Alde-Ore Estuary Special Protection Area	Lesser black backed gull	In-combination collision risk

1.2 The Applicant's position on the Need for Derogation

6. The Applicant has provided information on all of the features listed in ***Table 1.1*** in the ***Information to Support Appropriate Assessment*** (ISAA) (APP-043). It is the Applicant's position in the ISAA that there would be no Adverse Effect on Integrity (AEoI) of any of the sites listed as a result of either project alone or in-combination effects. The Applicant has engaged with Interested Parties and has considered comments raised in their Relevant Representations but does not consider that any of the issues raised alter the position stated at the time of the application.

7. This document therefore has been written to respond to the ExA's Procedural Decision 18 question which referenced the following statement from the Secretary of State in the Hornsea Project Three decision of 1st July 2020[2]

7.3 The Secretary of State is clear that the development consent process for nationally significant infrastructure projects is not designed for consultation on complex issues, such as Habitats Regulations Assessment, to take place after the conclusion of the examination…... It is therefore important that potential adverse impacts on the integrity of designated sites are identified during the pre-application period and full consideration is given to the need for derogation of the Habitat Regulations during the examination…….

7.4 This does not mean that it is necessary for Applicants to agree with statutory nature conservations bodies ("SNCBs") if SNCBs consider that there would be significant adverse impacts on designated sites. The final decision on such matters remains for the Secretary of State (though the Secretary of State reserves the right not to request further evidence from Applicants following the examination). Applicants should be assured that where they disagree with SNCBs and maintain a position that there are no significant adverse impacts, but provide evidence of possible compensatory measures for consideration at the examination on a "without prejudice" basis, both the ExA in the examination and the Secretary of State in the decision period will give full and proper to

[2] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-003225-Hornsea%20Project%20Three%20Minded%20To%20Letter%20-%201%20July%202020.pdf

consideration to the question of whether there are or are not significant adverse impacts. It will not be assumed that the provision of information regarding possible compensatory measures signifies agreement as to the existence of significant adverse impacts. The ExA will be required to provide an opinion on the sufficiency of the proposed compensation even if it considers that compensation is not required (in case the Secretary of State disagrees with that conclusion), but such measures would only be required if the Secretary of State were to find that there would be significant adverse impacts (and that the proposed compensatory measures are appropriate).

8. Notwithstanding the Applicant's position that there will be no AEoI of any designated site, this document presents the case for derogation under the Habitats Directive on a **without prejudice basis** to allow for full consideration of all aspects during the Examination.

1.3 Document Structure

9. This document on the derogation provisions comprises five sections detailed in ***Table 1.2*** below.

Table 1.2 Document Structure

Heading	Description / Content	Report Section
Introduction	Details the background, basis and scope of this document.	1
Legislation and Guidance	This section gives an overview of the legal context and Habitat Regulations Assessment (HRA) process.	2
Project need	Outlines need for the project.	3
Alternatives Solutions	This examines whether there are any feasible alternative solutions to the project that meet the project objectives.	4
Imperative Reasons of Overriding Public Interest	This section identifies the IROPI which would justify a decision by the Secretary of State to authorise the project notwithstanding any AEOI conclusion. This includes definition of the Project's Objectives.	5
Compensatory Measures	This section highlights the individual compensation measures developed for each of the sites and features.	6
Summary	Summary of sections 3 to 6	7

2 Legislation and Guidance

2.1 Legislation

10. Detailed information on the legal and policy context can be found in ***section 4*** of the ***Development Consent and Planning Statement*** (APP-579), ***Chapter 2 Need for the Project*** (APP-050) ***and Chapter 3 Policy and Legislative Context*** (APP-051) of the Environmental Statement) and in ***section 9*** of the ***Statement of Reasons*** (APP-026).

11. European Council Directive 92/43/EEC on the 'Conservation of natural habitats and of wild fauna and flora', (hereinafter referred to as the Habitats Directive) is the means by which the European Union meets its obligations in relation to natural habitats, flora and fauna agreed under the Bern Convention[3]. The Habitats Directive is one of the EU's two key directives in relation to wildlife and nature conservation, the other being the EC Directive 2009/147/EC on the conservation of wild birds (hereinafter referred to as the Birds Directive). These Directives provide for the protection of animal and plant species of European importance and the habitats which support them, particularly through the establishment of a network of protected sites, called Natura 2000. The Natura 2000 network (hereafter referred to as European sites) consists of Special Protection Areas (SPA) classified pursuant to the Birds Directive and Special Areas of Conservation (SAC) designated pursuant to the Habitats Directive.

12. European sites must be managed, conserved and protected according to the provisions of article 6 of the Habitats Directive. Article 6(2) concerns day-to-day management and conservation of European sites. In addition, Articles 4(1) and 4(2) of the Birds Directive will potentially be relevant in the consideration of matters relating to SPAs. The relevant requirements relating to the authorisation of plans or projects which may affect European sites are contained in articles 6(3) and 6(4) of the Habitats Directive. Article 6(3) of the directive requires Member states to ensure the appropriate assessment of plans and projects likely to have a significant effect on a European site, allowing plans and projects to proceed (subject to the provisions of Article 6(4)), only if it can be ascertained that they will not adversely affect the integrity of European sites (either alone or in combination with other plans or projects). Article 6(4) requires that in the event of a negative assessment of the implications for the site and in the absence of alternative solutions, if there are imperative reasons of overriding public interest to permit the plan or project then in such cases, the appropriate authority must

[3] The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) was adopted in Bern, Switzerland in 1979, and came into force in 1982. It is a binding international legal instrument for nature conservation that covers the natural heritage of the European continent and some African states.

secure that any necessary compensatory measures are taken to ensure that the overall coherence of the Natura 2000 Network is protected.

13. In England and Wales, the Conservation of Habitats and Species Regulations 2017 (the Terrestrial Habitats Regulations) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (the Offshore Habitats Regulations – together 'the Habitats Regulations') transpose various obligations of the Birds and Habitats Directives into domestic legislation. For the purposes of Nationally Significant Infrastructure Projects (NSIPs), the provisions of Article 6(3) are found within Regulation 28 of the Offshore Habitats Regulations and Regulation 63 of the Terrestrial Habitats Regulations. With the provisions of Article 6(4) found within Regulations 29 and 36 of the Offshore Habitats Regulations and Regulations 64 and 68 of the Terrestrial Habitats Regulations.

2.2 Guidance

14. As well as relevant legal and planning precedent, the following UK and EC guidance addresses the derogation provisions/ article 6(4) and is referred to, where applicable and appropriate, throughout this document:

- EC (2001): Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC
- EC (2007): Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC: clarification of the concepts of Alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the Commission.
- EC (2012): Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC.
- DEFRA (2012): Habitats and Wild Birds Directives: guidance on the application of article 6(4) Alternative solutions, imperative reasons of overriding public interest (IROPI) and compensatory measures
- Planning Inspectorate (2017): Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects.
- Tyldesley and Chapman (2017) Habitats Regulations Assessment Handbook
- EC (2019): Managing Natura 2000 sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC

2.3 UK Precedent

15. The approach to this derogation case has been developed through consideration of UK precedents, namely:

- The approach taken in the Able Marine Energy Park Draft Development Consent Order (DCO) application and examination (including the applicant's

HRA report (Able Marine Energy 2013), Examining Authority report (Planning Inspectorate 2013) and the Secretary of State (SoS) decision (Department for Transport 2013)) (2013);

- The approach taken by Wylfa Newydd Project (including the applicant's HRA Stage 3 Assessment of Alternative Solutions and Imperative Reasons of Overriding Public Interest (IROPI) Report (Horizon Nuclear Power 2019);
- The Thanet Extension application and examination documents (summarised in Planning Inspectorate 2020) and the HRA produced by the SoS (BEIS 2020) (2nd June 2020). The Thanet Extension was refused consent (albeit not on HRA concerns);
- The Hornsea Project Three application and examination documents (summarised in Planning Inspectorate 2020a) and the HRA produced by the SoS (BEIS 2020a) (December 2020). Hornsea Project Three was granted consent on 31 December 2020;
- The Norfolk Vanguard application and examination documents (summarised in Planning Inspectorate 2020b) and the HRA produced by the SoS (BEIS 2020b) (1st July 2020). Norfolk Vanguard was consented; and
- The Norfolk Boreas application and examination documents and derogation documents (summarised in Planning Inspectorate 2020c). The Norfolk Boreas examination closed on 12th October 2020.

2.4 The Habitats Regulations Assessment Process

16. Overarching guidance on the HRA process was provided by the EC in 2019, within the document titled 'Managing Natura 2000 sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC' (EC 2019). Effectively, Article 6(3) provides for the requirements for Screening and Appropriate Assessment, with Article 6(4) addressing alternatives, Imperative Reasons of Overriding Public Interest (IROPI) and compensation. Further guidance on Article 6(4) specifically was provided by the EC in 2012 in a 'Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC' (EC 2012).

17. Planning Inspectorate Advice Note Ten (Planning Inspectorate 2017) addresses HRA relevant to Nationally Significant Infrastructure Projects (NSIPs). HRA must be carried out by the competent authority, in this case the Secretary of State, on the basis of the information available, including as provided by the ExA's findings and conclusions, and by its recommendation on the decision to be made on the application. The HRA process follows a four-stage approach, as summarised below and detailed in sections 2.4.1– 2.4.4. Stages 1 and 2 of the PINS Advice Note correspond to Article 6(3), with Stages 3 and 4 of the PINS Advice Note corresponding to Article 6(4).

18. The ***Information to Support Appropriate Assessment*** (ISAA) (APP-043) submitted by the Applicant with the Application provides the detail on the methodology used by the Applicant and the information and evidence submitted in respect of HRA Stages 1 and 2. Further information to clarify issues raised by Interested Parties during the examination was provided in the following documents:

- ***Offshore Ornithology Cumulative and In Combination Collision Risk Update*** (REP1-047); and
- ***Displacement of Red-throated Divers in the Outer Thames Estuary SPA*** (document reference ExA.AS-4.D3.V1).

2.4.1 Stage 1 Screening for Likely Significant Effects

19. In Stage 1, European sites are screened for any likely significant effect (LSE) that might result from the project alone or in combination with other projects. Where it can be determined that there is no potential for LSE to occur to interest features of a site, that site is sought to be screened out.

20. Mitigation, including embedded mitigation, is not taken into account at Stage 1 HRA Screening, but is included during the Stage 2 assessment.

21. The Planning Inspectorate advises that for those projects where no LSE is predicted then that should be reported in the form of a No Significant Effects Report (NSER) and there is no requirement to undertake the Stage 2 assessment (Planning Inspectorate 2017).

2.4.2 Stage 2 Appropriate Assessment

22. An Appropriate Assessment is an assessment carried out under Article 6(3) of the Habitats Directive. The aim is to assess whether the proposals will have any adverse effects on the integrity of the European site. Site integrity is defined as:

"The 'integrity of the site' can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated." (EC 2019).

23. The decision on whether the integrity of the site could be adversely affected by the proposals should be taken in view of the site's Conservation Objectives.

24. For those sites where LSE cannot be excluded in Stage 1, further information to inform the Appropriate Assessment is prepared. The Appropriate Assessment will determine whether the project alone or in-combination could adversely affect the integrity of the designated site in view of its conservation objectives. The assessment and conclusions of the Appropriate Assessment will be reported in

the form of a HRA Report and the results of the Appropriate Assessment summarised in a series of matrices.

2.4.3 Stage 3 Assessment of Alternative Solutions

25. In cases where the Appropriate Assessment concludes that a plan or project (either alone or in-combination) has an AEoI on one or more European site, the assessment proceeds to Stage 3.

26. Stage 3 investigates 'feasible' alternative solutions (EC 2019) for delivering the objective of the plan or project, which could be less damaging to the integrity of European sites.

27. All feasible alternatives have to be analysed to ensure that there are none which *"better respect the integrity of the site in question"* and its contribution to the overall coherence of the European site network (EC 2019). The Planning Inspectorate advises that alternative solutions can include a proposal of a different scale, a different location and an option of not having the scheme at all - the 'do nothing' approach.

28. If an alternative solution is identified that will either avoid any adverse impacts or result in a less severe impact on the designated site, it will be necessary to assess the potential impact by recommencing the assessment at Stage 1 or Stage 2 as appropriate. However, if it can be reasonably and objectively concluded that there is an absence of alternatives, the assessment proceeds to Stage 4.

2.4.4 Stage 4 IROPI and Compensation

29. Where it cannot be objectively concluded that there will be no adverse impacts upon the European sites and it has been demonstrated that there are no reasonable alternative solutions, a plan or project can proceed if there are Imperative Reasons of Overriding Public Interest (IROPI) why a plan or project should be approved.

30. Stage 4 considers whether a plan or project has IROPI. The DEFRA 2012 guidance states that the type of IROPI that a competent authority can consider will depend on the nature of the site that will be affected. The parameters of IROPI are explored in guidance provided by DEFRA (2012) and the European Commission (2019), which identify the following principles (as synthesized in BEIS 2020a):

- Imperative: Urgency and importance: There would usually be urgency to the objective(s) and it must be considered "indispensable" or "essential" (i.e. imperative). In practical terms, this can be evidenced where the objective falls within a framework for one or more of the following:

- Actions or policies aiming to protect fundamental values for citizens' life (health, safety, environment);
- Fundamental policies for the State and the Society; or
- Activities of an economic or social nature, fulfilling specific obligations of public service.

- Public interest: The interest must be a public rather than a solely private interest (although a private interest can coincide with delivery of a public objective).
- Long-term: The interest would generally be long-term; short-term interests are unlikely to be regarded as overriding because the conservation objectives of the Habitats and Birds Directives are long term interests.
- Overriding: The public interest of development must be greater than the public interest of conservation of the relevant European site(s).

31. Once IROPI have been demonstrated, a project may be authorised, and the appropriate authority must secure that any necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000 is protected.

32. To ensure the overall coherence of the Natura 2000 network, the compensatory measures proposed for a project should address, in comparable proportions, the habitats and species negatively affected; concern the same biogeographical region in the same Member State; and provide functions comparable to those which had justified the selection criteria of the original site (EC 2007).

3 Project Need

33. This section identifies the urgent need for new offshore wind generated electricity capacity and for this project in particular, as reflected in established public policy. This includes National Policy Statements (NPSs) and how need has changed since these were designated under the Planning Act 2008, together with a range of other UK and European policy imperatives, including Government policy established in the Queen's speech on 19th December 2019 that the Government will increase its *"ambition on offshore wind to 40GW by 2030"*. The 40GW by 2030 ambition was reaffirmed by the Government's 'Ten Point Plan for a Green Industrial Revolution' on the 18th November 2020[4].

34. The Overarching National Policy Statement for Energy (EN-1) (DECC 2011) explains the two key policy goals that drive the need for new electricity generation. The first is the need to decarbonise the economy. The second is that it is critical that the UK continues to have a secure and reliable supply of electricity as it makes the transition to a low carbon economy.

3.1 The Need to Decarbonise the Economy

35. The Intergovernmental Panel on Climate Change (IPCC) has voiced serious concerns about the pace of climate change. It believes that the world is heading towards temperature rises of 3°C above pre-industrial levels and that policy makers need to consider more rapid and far-reaching measures to avert disaster (IPCC 2018). Human induced global warming has already caused multiple observed changes in the climate system. Changes include increases in both terrestrial and marine temperatures, as well as more frequent heatwaves in most land regions. Global warming has resulted in an increase in the frequency and duration of marine heatwaves. Further, there is substantial evidence that human-induced global warming has led to an increase in the frequency, intensity and/or amount of heavy precipitation events at the global scale, as well as an increased risk of drought in the Mediterranean region (IPCC 2018).

36. All the top 10 warmest years for the UK in the series from 1884 have occurred since 2002 (Kendon et al. 2019). In the UK, the most recent decade (2009–2018) has been on average 0.3°C warmer than the 1981–2010 average and 0.9°C warmer than 1961–1990 (Kendon et al 2019). With global warming having reached an average of 1°C above pre-industrial levels in 2017, the IPCC is confident, if it continues to increase at the current rate, that global warming is likely to reach an average of 1.5°C above pre-industrial levels between 2030 and 2052. Impacts associated with an increase in Global Mean Surface Temperature

[4] https://www.gov.uk/government/news/pm-outlines-his-ten-point-plan-for-a-green-industrial-revolution-for-250000-jobs

(GMST) an average of 1.5°C above pre-industrial levels on natural and human systems are detailed in ***Table 3.1***.

Table 3.1 Impacts associated with a global temperature increase of 1.5°C above pre-industrial levels on natural and human systems (Chapter 3, IPCC 2018)

Sector	Impact
Terrestrial ecosystems	Species range loss (the number of species projected to lose over half of their climatically determined geographic range at 1.5°C global warming; 6% of insects, 8% of plants and 4% of vertebrates) Loss of ecosystem functioning and services Increase in other biodiversity-related factors, such as forest fires, extreme weather events, and the spread of invasive species, pests and diseases
Marine Ecosystems	Decline in ocean productivity; Shifts of species (e.g. plankton, fish) to higher latitudes; Damage to ecosystems (e.g., coral reefs, and mangroves, seagrass and other wetland ecosystems); Loss of fisheries productivity (at low latitudes); and Changes to ocean chemistry (e.g., acidification, hypoxia and dead zones).
Coastal processes	Sea level rise, increased storminess
Water Resources	Increased frequency and magnitude of floods and droughts in some regions
Land Use, Food Security and Food Production Systems	Reductions in yields of maize, rice, wheat, and potentially other cereal crops, particularly in sub-Saharan Africa, Southeast Asia, and Central and South America; and in the CO2-dependent nutritional quality of rice and wheat A loss of 7–10% of rangeland livestock globally is projected for approximately 2°C of warming with considerable economic consequences for many communities and regions Fisheries and aquaculture are important to global food security but are already facing increasing risks from ocean warming and acidification, impacting key organisms such as fin fish and bivalves (e.g., oysters), especially at low latitudes Risks of impacts and decreasing food security are projected to become greater as global warming reaches beyond 1.5°C and both ocean warming and acidification increase, with substantial losses likely for coastal livelihoods and industries (e.g., fisheries and aquaculture)
Human Health, Well-Being, Cities and Poverty	Any increase in global temperature (e.g. +0.5°C) is projected to affect human health, with primarily negative consequences (high confidence). Lower risks are projected at 1.5°C than at 2°C for heat-related morbidity and mortality Urban heat islands often amplify the impacts of heatwaves in cities (high confidence). Risks for some vector-borne diseases, such as malaria and dengue fever are projected to increase with warming from 1.5°C to 2°C, including potential shifts in their geographic range (high confidence). Poverty and disadvantage have increased with recent warming (about 1°C) and are expected to increase for many populations as average global temperatures increase from 1°C to 1.5°C and higher (medium confidence).

37. In terms of seabird ecology, a large body of evidence (reviewed in Rijkswaterstaat Zee & Delta (2020)) identifies climate change as a major driver of seabird population demographics worldwide. Much of this adverse effect is due to indirect impacts from climate driven changes in prey availability, but also from direct effects of poor and extreme weather events (Rijkswaterstaat Zee & Delta 2020).

38. Locally, climate change has been greatly affecting coastal areas, including in East Anglia, where coastal erosion has become a greater problem now than in the past due to a combination of increasing storm frequency (due in part to climate change) and the already sensitive nature of the East Anglia coast to this erosion (Living with Environmental Change 2015). As such, East Anglia itself will benefit from any efforts to reduce the UK's reliance on fossil fuel-based electricity production. An offshore windfarm off the coast of East Anglia would make East Anglia part of a global solution to a problem that directly impacts the area.

39. The IPCC (2018) state that any path to limiting global warming to less than 1.5°C will require significant emissions reductions before 2030, likely equating to a 40–50% reduction from 2010 levels. It is therefore necessary for the UK to reduce its use of fossil fuels, particularly in the four largest sectors for emissions: transport, industry, heating for buildings, and electricity generation (Ofgem 2019).

40. The Climate Change Act 2008 set legally binding carbon targets for the UK, aiming to cut emissions (versus 1990 baselines) by 34% by 2020 and at least 80% by 2050 '*through investment in energy efficiency and clean energy technologies such as renewables, nuclear and carbon capture and storage'*.

41. The UK made a commitment during the 21st United Nations Framework Convention on Climate Change Conference of the Parties (COP21) in Paris in 2015 to pursue efforts to limit the global temperature increase to within 2°C of the pre-industrial average temperature, with an aspiration for an improved limit of 1.5°C. In October 2018, the IPCC released a report noting that a global temperature rise of no more than 1.5°C would prevent '*long lasting and irreversible changes'* to the global climate. In order to achieve this lower temperature target, the IPCC report outlines that the world would need to reach a point of 'net zero' greenhouse gas emissions by 2050. The UK is a party in its own right to international climate change agreements and has signalled its intention to retain these commitments following its expected withdrawal from the EU (BEIS 2019).

42. In May 2019 the UK Parliament declared a 'climate change emergency'. Following this, the Climate Change Act 2008 (2050 Target Amendment) Order 2019 updated the target originally set by the Climate Change Act 2008 of an

emission reduction of 80 percent of the 1990 levels by 2050, to a new target of net zero emissions by 2050. The need to increase energy generation from low carbon sources has been legislated for in the UK through the target of 15% of all energy needs to be met from renewable sources enacted in The Promotion of the Use of Energy from Renewable Sources Regulations 2011, although the current renewable targets relate to 2020, the need to reduce carbon emissions is clearly a long term endeavour and that need does not end in 2020. Moreover, the revised European Renewable Energy Directive (2018/2001/EU) sets the target of 32% of energy from renewables by 2030, with a clause for a possible upwards revision by 2023.

43. The Committee on Climate Change advice to UK, Scottish and Welsh governments determined that reaching the net zero target in the UK is largely achievable with known technologies, but that further policies and concerted action was required to reach this goal (CCC 2019). The CCC report highlighted that extensive electrification, particularly of transport and heating, would require a major expansion of renewable and other low-carbon power generation, leading to around a doubling of electricity demand.

44. Locally, Suffolk County Council have also declared a climate emergency and pledged to work towards making the county of Suffolk carbon neutral by 2030, by working with partners across the county and region, including the Local Enterprise Partnership (LEP) and the Public-Sector Leaders, to deliver this new goal through all relevant strategies and plans (Suffolk County Council 2020). One of the objectives highlighted by the Policy Development Panel is to purchase of 100% renewable electricity for all services under Suffolk County Council control *"at the earliest opportunity"*.

3.2 Meeting Energy Security and Carbon Reduction Objectives

3.2.1 Introduction

45. NPS EN-1 concludes that the UK would need at least 113 GW of total electricity generating capacity by 2025 of which at least 59GW would be new build; paragraph 3.3.24 presents this as a minimum figure to be delivered. While uncertainties exist, the following factors together reinforce the conclusion that the need for new and additional generation capacity is significant:

- Total generating capacity has dropped 13GW from 2010 to 2019, fossil fuel capacity particularly has closed, while renewable capacity has increased fourfold (BEIS 2020c);
- Closures of fossil fuel generators, most notably coal and nuclear, are expected to intensify, further losses of 19 – 22GW (by 2025 over and above the 22GW anticipated in NPS EN-1) are proposed, meaning a total loss from

these sources of 41 – 44GW (BEIS 2018). There were only five major coal power stations remaining at the end of 2019 (BEIS 2020c); and

- Overall electricity demand is likely to rise during the 2020s as a greater proportion of the UK's heat and transportation systems electrify. Differing figures are presented by BEIS and the CCC, depending on levels of electrification. NPS EN-1 envisages a doubling or tripling in demand, while the more recent CCC work translates this into new demand for up to 32GW (de-rated) additional electricity capacity by 2025.

46. In summary, whilst demand is projected to rise, the energy generating capacity is decreasing as existing generation is decommissioned.

3.2.2 Policy and Legislative Targets

47. Since publication of NPS EN-1 in 2011, which set the policy framework for major offshore wind farm projects, there have been notable developments in Government policy and legislation, including:

- The Clean Growth Strategy (BEIS 2017) sets out how the UK Government intends to decarbonise all sectors of the UK economy through the 2020s, including innovation in the power sector (including renewables);
- In March 2019, the UK offshore wind sector committed to a Sector Deal (BEIS 2019) which aims to increase offshore wind capacity to 30GW by 2030, which represents an increase from the approximately 9.7GW currently deployed today, envisaging an investment of £48 billion in UK offshore wind infrastructure;
- The UK Government's confirmation of continuing Contracts for Difference allocation rounds for less established technologies (such as offshore wind) which commenced in 2019, with another allocation round in 2021 and auctions every two years thereafter, reaffirming the Government's commitment to supporting some renewable technologies;
- The Climate Change Act 2008 (2050 Target Amendment) Order 2019 which commits the UK to net zero greenhouse gas emissions by 2050;
- The UK Government announcement in the Queens Speech on 19th December 2019 that its policy is now to "*increase our ambition on offshore wind to 40GW by 2030*".
- Decisions of the European Parliament, on 28th November 2019, to declare a climate emergency and of the European Commission to propose an increase in the EU's current 2030 target of at least 40% greenhouse gas emission reductions to at least 50% and towards 55%, compared to 1990 emission levels through an amendment of the recently proposed European Climate Law. Revising the current 2030 target upwards is to put the EU on a more

gradual pathway towards achieving its objective to become climate-neutral by 2050. Consultation on the proposals closed on 23rd June 2020 and feedback from this consultation has been taken into account in the 2030 Climate target Plan, published in September 2020[5].

48. These commitments, and especially the updated Climate Change Act serve to demonstrate that the urgent need originally set out in NPS EN-1 is now even more pronounced, particularly where reference is made to meeting the country's 2050 obligations. The scale of the contribution required from offshore wind to the electricity supply is reflected in the targets set by the Government in the 2019 Queen's Speech.

3.2.3 Decommissioning Electricity Generating Capacity

49. Around a quarter of the total generating capacity (22GW of 85GW) was scheduled to need replacing, with much of this by 2020. Since publication of the NPS EN-1 several additional factors have led to an even higher figure than envisaged:

- The UK Government has committed to a complete phase out of coal fired power stations by 2025 and restrictions on its use from 2023 (UK Government 2015). European pollution standards, and the UK's minimum floor price set in the Government's 2013 Control for Low Carbon Levies, meant that in 2018 a combined capacity of around 11GW of coal generated less than 16TWh (approximately 4.8% of total generation), compared with 103TWh in 2011 (BEIS 2018a);
- Nearly 16GW of fossil fuel and 1.5GW of nuclear capacity had closed by 2017, totalling 17.5GW (CCC 2017);
- Although subject to life extensions four nuclear stations are scheduled for closure by 2025 with a combined net capacity of around 4GW[6]; and
- According to CCC analysis in 2015,11.6GW of combined cycle gas turbines (CCGT) will have closed by 2025 (CCC 2015).

50. As a result, between 41GW and 44GW of coal, gas and nuclear closures are expected by 2025 (BEIS 2018), which is significantly larger than the NPS EN-1 figure of 22GW. Paragraph 3.3.9 of NPS EN-1 is clear that "*any reduction in generation capacity from current levels will need to be replaced in order to ensure security of supply is maintained*."

[5] https://ec.europa.eu/clima/policies/eu-climate-action/2030_ctp_en#:~:text=With%20the%202030%20Climate%20Target,target%20of%20at%20least%2040%25
[6] Nuclear power in the United Kingdom, Wikipedia

3.2.4 New Generation Pipeline

51. The pipeline of NSIP energy projects (Planning Inspectorate 2019) and other onshore and offshore wind projects over 50MW is between 42 and 79GW (2011 – 2019) (***see Table 3.2***). However:

- Only around 30.5GW of these projects are renewable or low carbon with a high degree of certainty of progressing (i.e. have submitted applications), which is well below the NPS EN-1 minimum of 33GW, the 40GW by 2030 government target for offshore wind and the 44GW of capacity that the CCC advises is needed to achieve the Fifth Carbon Budget (CCC 2015); and
- As noted above, a larger number of existing plants have closed than envisaged when the minimum target was set.

52. Therefore, the pipeline of NSIP energy projects will not meet the level of need arising or the government policy objectives for provision of 40GW of offshore wind by 2030.

53. ***Table 3.2*** summarises estimates of the likely shortfall in capacity during the 2020s.

Table 3.2 Summary table of Estimated Changes in Capacity, Demand and Shortfall During 2020s (Figures Rounded) (BEIS 2018) (Planning Inspectorate 2019)

Capacity and Demand	Amount (GW)	Cumulative Total (GW)
Capacity		
A – Total capacity 2017	81	
B – Closures by 2025 (mid estimate)	-43	
C – Total capacity by 2025		38 (A + B)
Capacity Requirement to Meet Demand		
D – Capacity increase requirement to meet newly arising demand 2017-2025 (CCC 2015 central estimate – de-rated)	32	
E – Total 2025 Capacity Requirement (2017capacity plus capacity increase requirement for 2017-2025)		113 (A + D)
New capacity		
F – Known higher certainty new capacity (consented or operational projects)	42	80 (C+F)
G – Known lower certainty new capacity (pre-decision projects)	79	118 (C + G)

Capacity and Demand	Amount (GW)	Cumulative Total (GW)
Shortfall		
H– Total minimum shortfall in capacity (higher certainty)		33 (113 – 80)

54. The Climate Change Act 2008 (2050 Target Amendment) Order 2019 has resulted in new policies to promote renewable and low carbon energy at the expense of fossil fuels without carbon capture and storage. Its effect on need is uncertain, but the CCC's analysis assumes deeper electrification and a bigger proportion of renewables. This means electricity demand is likely to be very much higher than the CCC's 2015 estimate, while more variable renewables would translate into a higher overall capacity shortfall than the 33GW set out above, due to de-rating.

55. The role of offshore wind in delivering additional renewable electricity capacity is highlighted by the CCC reports (CCC 2015a, 2019), which also recognise that the offshore wind sector is now maturing and showing very significant cost reductions. The recent Sector Deal (BEIS 2019) and net zero analysis by CCC seeks around 30GW of offshore wind to be deployed by 2030. In June 2020, the CCC confirmed their support for the revised UK target to deliver at least 40GW of offshore wind by 2030.

56. It is reasonable to conclude, therefore, that the 33GW shortfall is an absolute minimum remaining energy gap, and very substantial weight should be accorded to the contribution the Project will make to satisfying this need.

3.2.4.1 Status of Offshore Wind

57. The UK Government policy is now to *"increase our ambition on offshore wind to 40GW by 2030"*. ***Table 3.3*** shows the current status of operational projects and those in development.

Table 3.3 Status of UK offshore windfarms (The Crown Estate (2019, 2020, 2020a))[7]

Project Status	Number of Projects	Capacity (MW)
Operational	39	9701

[7] Categories are taken from The Crown Estate (2020), projects 'in planning' include all submitted planning applications, 'pre-planning' include all projects currently announced i.e. remaining Round 3 or 2017 extension projects. These figures incorporate Scottish projects not included in The Crown Estate (2020) and are updated to reflect Norfolk Vanguard consent and the refusal of Thanet Extension and the expected capacities of the 2017 Extensions.

Project Status	Number of Projects	Capacity (MW)
Under Construction	6	4405
Government support on offer	6	5466
Consented	5	4,842
In Planning	4	5,900
Pre-Planning	9	6,050
Total	69	36,364

58. It can be seen that to get from the current position of 9.7GW in operation to 40GW by 2030 will take an unprecedented effort. Even assuming that all projects in development (i.e. excluding any future licencing rounds) are consented and subsequently constructed and operational by 2030, there is a deficit of around 4GW to meet the target. This highlights the importance of all of the projects either in-planning or pre-planning to closing the gap between current capacity and the Government's ambition.

59. When considering future licencing, The Crown Estate's Round 4 leasing Round aims to deliver at least 7GW of new projects, whilst the Scottish Government's ScotWind process aims to deliver 10GW in Scottish waters by 2030 (including those projects already in development)[8]. These processes are currently at the stage of pre-leasing activities with the Plan-Level HRAs to be undertaken prior to award of any leases. When applying the typical development timescales of around ten years from agreement of lease to commissioning (see The Crown Estate (2020b), *Section 8 Offshore wind project life-cycle*), projects consented under these leasing rounds would be likely to commence construction only from the late 2020s and as such would be unlikely to be generating power on any scale before 2030.

60. The Project, at 800MW represents 5% of the current gap between operational, in-construction and other consented projects and the 40GW target. Therefore, the Project represents a major contribution to the development needed to bridge the gap between the capacity currently deployed and the 2030 target.

3.2.5 Future Increases in Electricity Demand

61. NPS EN-1 (paragraphs 3.3.13 – 3.3.14) anticipates that large parts of the country's heat and transportation demand will be electrified, meaning total

[8] https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-offshore-wind-energy/documents/sectoral-marine-plan-offshore-wind-energy/sectoral-marine-plan-offshore-wind-energy/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy.pdf

electricity consumption (measured in terawatt hours over a year) could double or even triple by 2050, depending on the choice of how electricity is supplied.

62. BEIS (BEIS 2018b) reference scenario[9] project predicts that total final electricity demand will fall slightly from 25.8 million tonnes of oil equivalent (Mtoe) in 2017 to 24.3 Mtoe in 2022. It is then projected to increase steadily, reaching 27.5 Mtoe in 2030.

63. In 2015, the CCC identified that as demand grows, more capacity will be needed and their central scenario would necessitate a total of 32GW of de-rated[10] electricity capacity by 2025 (CCC 2015). The Project would contribute 800MW towards this.

64. Section 3.4 of NPS EN-1 commits to a dramatic increase in capacity from renewables, but paragraph 3.3.11 notes that back-up for the intermittency of most renewable generation is required. At present, this is likely to come from fossil fuel generation but in future, electricity storage, interconnection and demand-side response could play a role.

65. In summary, the precise increase in electricity demand is uncertain, but is likely to be considerably higher than today, particularly now that the Government has legislated for net zero emissions. This translates into very significant need for large-scale renewable energy projects.

3.2.6 Alternatives

66. NPS EN-1 is clear that while alternatives to new large-scale generation are important, they will not be sufficient to meet energy and climate change objectives. Therefore, regardless of progress, the Government considers that growth in alternatives do not materially affect the need for new and additional generation capacity. The following sections consider whether or not progress since 2011 is in line with the NPS expectations and whether any factors exist that might justify reconsidering this position.

3.2.6.1 Reducing Demand

67. The policy measures referred to in paragraphs 3.3.27 – 3.3.29 of NPS EN-1 have had mixed success. On the one hand, the Green Deal[11] has been effectively scrapped (in 2015 the Government announced no further funding would be provided) and the smart meter roll out has been slower than originally envisaged.

[9] Reference scenario is based on central estimates of economic growth and fossil fuel prices. Contains all agreed policies where decisions on policy design are sufficiently advanced to allow robust estimates of impact (i.e. including "planned" policies).
[10] De-rated capacity is the metric used to standardise electricity generation capacity across technologies with different availabilities. It reflects the probable proportion of a source of electricity which is likely to be technically available to generate (even though a company may choose not to utilise this capacity for any reason) (CCC 2015).
[11] https://www.gov.uk/green-deal-energy-saving-measures

On the other hand, dramatic reductions in the cost of super-efficient Light Emitting Diode (LED) light bulbs means they are rapidly replacing incandescent and even halogen bulbs, while the period in which Feed-in-Tariff payments were available saw deployment of small-scale (<50kW) solar photovoltaic installations grow from almost zero to over 7GW (BEIS 2019a).

68. Nonetheless, as discussed in ***section 3.2.5***, electricity demand is expected to rise during the 2020s as electrification of transport and heat gathers pace. The NPS conclusion that efficiency will not be sufficient on its own to reduce the need for new generation, therefore, appears to remain sound.

69. It is worth noting however that, contrary to UK Government assumptions in 2011 (paragraph 3.3.29), a clear trend is emerging towards a more decentralised energy system. Most of the (at least) 7GW of utility-scale solar since 2010 (BEIS 2019a) and around half of onshore wind is connected to the distribution rather than transmission network. This is affecting how system operator National Grid views the future electricity system. Its annual Future Energy Scenarios show that in 2017, 75GW of capacity was connected to the transmission network, while 28GW was either distribution connected or micro capacity (National Grid 2019). Their latest scenarios anticipate 79-110GW of transmission capacity and 37-72GW of distribution connected and micro capacity by 2030.

70. This is relevant to an assessment of demand since National Grid count distribution scale generation as a reduction in energy demand rather than additional generation and so significant deployment will impact on overall need.

71. Both solar and onshore wind deployment have seen huge growth since 2011 but were adversely affected by post 2015 Government policy in which both technologies were excluded from the Renewables Obligation and Contracts for Difference rounds. This policy was reversed in March 2020[12]. However, in the absence of Government support large scale subsidy free solar projects have come forward. Research by Solar Media published at the start of 2019 showed nearly 1.5GW of applications had been submitted for planning permission (Solar Media 2019). Due to the size of these projects, most will be sub-50MW and connected to the distribution network.

72. The future balance between transmission and distribution connected capacity is uncertain but even in National Grid's most decentralised scenario, the amount of very large-scale capacity connected to the transmission network will grow relative to the current situation.

[12] https://www.gov.uk/government/news/millions-more-homes-to-be-powered-by-renewables

3.2.6.2 More Intelligent Use of Electricity

73. In 2011 NPS EN-1 did not envisage smart energy systems or new electricity storage technologies, such as batteries, playing an important role before 2020. In reality, utility scale projects have already started to appear on the system, driven in part by very significant technology cost reductions. National Grid data show 3.4GW of capacity in 2018 and scenarios of between around 6GW and 9GW by 2030 (National Grid 2019). These range from projects connected directly to the distribution or transmission network to those designed to allow renewable energy projects to provide more dispatchable power (known as "behind the meter").

74. The UK Government in 2011 expected "*that demand side response, storage and interconnection, will play important roles in a low carbon electricity system, but still envisages back up capacity being necessary to ensure security of supply until other storage technologies reach maturity*" (NPS EN-1 paragraph 3.3.31).

75. Today this conclusion broadly holds, but the transition towards a more decentralised electricity system is reshaping the energy landscape. In a market system, in which lowest cost technologies will normally get built at the expense of higher cost ones, without specific policy support this trend is likely to see large-scale fossil fuels and nuclear lose out to increasingly cheap renewables. This is illustrated in the CCC's analysis of marginal abatement costs, in which renewables have a negative cost per tonne of CO_2 saved, whereas CCS and peak gas plants are well above £100/tonne (CCC 2018).

76. Ultimately, a more decentralised system in which free-fuel technologies (e.g. solar, wind, batteries, demand-side management) become cheaper will increase the overall capacity need for large and small-scale renewable generation projects since these technologies typically have lower load factors[13].

3.2.6.3 Interconnectors

77. In 2011, NPS EN-1 envisaged up to 10GW of interconnectors by 2020:

"*However, it cannot be assumed that they will all go ahead, so the UK's level of interconnection is likely to remain relatively low for the foreseeable future. Increased investment in interconnection is therefore unlikely to reduce the need for new infrastructure in the UK to a great extent*."

78. In 2018 there was just under 4GW of operational interconnectors between Great Britain, the Continent and Ireland (National Grid 2019). National Grid's Future

[13] Load factors allow different technologies with differing generation capacity to be compared with one-another. They are presented on the basis of net of availability, expressed on a total installed capacity, e.g. new build offshore wind in England is 47.3%, so a 1MW turbine will generate (1 x 8766h/year x 0.473) 4.1GWh, whereas a new 1MW biomass plant would generate 5.9GWh (1 x 8766h/year x 0.674).

Energy Scenarios 2020 (NGE, 2020) point to the current 5GW of capacity available from interconnectors rising to between 8 to 10GW (lower range scenarios) and 15 to 18GW (upper range scenarios) which *"assume continued cooperation on trade of electricity after the UK's exit from the European Union*" and "*that a negotiated deal closely replicates current arrangements*". On the face of it, likely additional capacity from interconnectors, would deliver no more than a maximum of 24% to 54% of the shortfall on the most optimistic of all scenarios. Reliance on interconnectors would also fail to deliver on increasing UK generation capacity necessary to serve Government policy objectives set out in both of the NPSs and in the Ten Point Plan for a 'Green Industrial Revolution' of 2020. In conclusion, ambitious scenarios for new interconnectors look increasingly unlikely to be realised, furthermore placing reliance on interconnectors in place of new capacity, would be contrary to established government policy to establish security of supply in the UK.

3.3 Conclusions on Need

79. Ultimately there is a need to decarbonise the UK energy supply in order to meet climate change obligations. This drives the need for low carbon sources for new generation capacity to replace existing generation and provide energy security.

80. It is clear from the preceding sections that the UK's energy system is undergoing a period of rapid change. The effects this will have in the coming decade on supply and demand profiles, the technologies and the scale of projects that will dominate are not yet fully clear. However, the following conclusions can be drawn, which together reinforce the NPS conclusion that growth in alternatives do not materially affect the need for new and additional generation capacity:

- Overall electricity demand is likely to rise during the 2020s as a greater proportion of the heat and transportation systems electrify;
- Even in National Grid's most decentralised scenario, the amount of large-scale capacity connected to the transmission network will grow relative to the current situation;
- In a market system, in which lowest cost technologies will normally get built at the expense of higher cost ones, this trend is likely to see large-scale fossil fuels and nuclear lose out to increasingly cheap renewables;
- Ultimately, a more decentralised system in which free-fuel technologies (solar, wind, batteries, demand-side management) become cheaper and cheaper will create even more need for large and small-scale renewable generation projects;
- It seems highly likely that a significant shortfall in interconnector capacity will remain into the 2020s and there being a need to ensure greater energy independence as a result;

- In 2011, NPS EN-1 envisaged an energy gap to 2025 of 59GW, 33GW of which was to be met from renewable sources, estimates since then suggest there will be an energy gap of 33GW to 2025 (and likely to be greater once stalled projects are discounted and the likely additional demand from the Net Zero legislation is accounted for); and
- Furthermore, insufficient renewable energy projects are expected to come forward to meet the 33GW of renewable energy envisaged in the NPS, the 44GW advised by the CCC as being required to meet the legally binding Fifth Carbon Budget, or any increase on this demanded by the new Net Zero target or the ambition for 40GW of offshore wind by 2030.

81. For all the above reasons, a significant need for nationally significant energy projects in general, and for renewable energy in particular, exists today as set out in NPS EN-1. The Project, by contributing 5% of the current gap between operational, in -construction and other consented projects and the 40GW target (see ***section 3.2.4.1***), would make a significant contribution to meeting the urgent need for renewable energy and for offshore wind in particular. This is in line with NPS EN-1 and multiple public policy objectives including, most recently, the Government commitment to 40GW of operational offshore wind by 2030.

4 Alternative Solutions

4.1 Approach to Assessing Alternatives

4.1.1 Assessment Process

82. The assessment of alternatives draws from the guidance documents listed in ***section 2.2***. The approach to establishing the absence of alternative solutions consists of five steps set out in ***Table 4.1***.

Table 4.1 Assessment of alternatives process

Step	Detail	Section
Step 1	Identify the need for the Project and define Project objectives.	***Section 4.2***
Step 2	Identify the relevant works and potential residual harm to the European sites.	***Section 4.2.1***
Step 3	Identify alternative solutions. This assessment will be undertaken in four stages:	***Section 4.4***
	Stage 1. The "Do nothing" or "Zero Option"	***Section 4.4.1***
	Stage 2. Is there an alternative form of energy generation?	***Section 4.4.2***
	Stage 3. Is there an Alternative Site that would result in less damage to the European sites? a. Locations in other countries. b. Locations outside English Waters. c. Locations outside former East Anglia Zone. d. Locations within former East Anglia Zone.	***Section 4.4.3***
	Stage 4. Is there an Alternative Design or Means of Operation that would be less damaging to the European site Network?	***Section 4.4.4***
Step 4	Are the alternatives solutions identified in Step 3 feasible? This step is assessed in parallel with the four stages set out in step 3.	***Sections 4.4.1 - 4.4.4***
Step 5	Assessment and comparative analysis of feasible alternative solutions.	***Section 4.6***

4.1.2 Alternatives must be feasible

83. Alternatives must be feasible. The word 'feasible' is important when used in Managing Natura 2000 guidance (EC 2019), which states:

"The decision to go ahead with a plan or project must meet the conditions and requirements of Article 6(4). In particular, it must be documented that: the alternative put forward for approval is the least damaging for habitats, for species and for the integrity of the Natura 2000 site(s), regardless of economic

considerations, and that no other feasible alternative exists that would not adversely affect the integrity of the site(s)"

84. The DEFRA 2012 guidance states that what must be considered are *"other feasible ways to deliver the overall objective of the plan or project*". The guidance explains that this means:

"The consideration of alternatives should be limited to options which are financially, legally and technically feasible. An alternative should not be ruled out simply because it would cause greater inconvenience or cost to the applicant. However, there would come a point where an alternative is so very expensive or technically or legally difficult that it would be unreasonable to consider it a feasible alternative"

85. Feasibility is therefore considered and applied by the applicant using the following broad criteria detailed in ***Table 4.2*** below.

Table 4.2 Definition of Legal, Technical and Financial Feasibility

Feasibility	Definition
Legal	A potential alternative would not be legally feasible where there is a legal impediment or where, from a legal or consenting perspective, it would be unreasonably difficult, or improbable that the consent would be granted, for example, on account of 'unacceptable' impacts.
Technical	A potential alternative would not be technically feasible where it is impractical, incapable of being implemented, technically unsound, unsuitable for deployment in the North Sea environment and/or would not meet safety or regulatory requirements (including health and safety).
Financial	A potential alternative would not be financially feasible where its cost could render the project (or a component part) unviable or is disproportionately high in the context of the scale of the reduction in the environmental effect that the alternative would achieve.

86. There are direct and indirect costs associated with potential alternative solutions. Direct costs include the cost of using more expensive equipment or the additional costs of constructing an alternative solution. Indirect costs would arise from the consequences of (for example) extending the Project construction schedule due to the adoption of an alternative methodology.

87. The consideration of alternatives is therefore not a speculative and hypothetical exercise. It must be grounded in the real world, with reference to proven options. The feasibility of each of the potential alternative solutions need to be assessed against the components of feasibility noted above.

88. EC guidance (EC 2019) similarly recognises that alternatives must be "feasible", and cost is a legitimate consideration. Section 5.3 of the Managing Natura 2000 guidance (headed "Initial Considerations" on page 54), in full, provides as follows:

"Subsequently, the competent authorities should examine the possibility of resorting to alternative solutions which better respect the integrity of the site in question. All feasible alternatives that meet the plan or project aims, in particular, their relative performance with regard to the site's conservation objectives, integrity and contribution to the overall coherence of the Natura 2000 network have to be analysed, taking also into account their proportionality in terms of cost. They might involve alternative locations or routes, different scales or designs of development, or alternative processes.

As concerns the economic cost of the steps that may be considered in the review of alternatives, it cannot be the sole determining factor in the choice of alternative solutions (C-399/14, paragraph 77). In other words, a project proponent cannot claim that alternatives have not been examined because they would cost too much.

In line with the principle of subsidiarity, it is for the competent national authorities to assess the relative impact of these alternative solutions on the site concerned. It should be stressed that the reference parameters for such comparisons deal with aspects concerning the conservation and the maintenance of the integrity of the site and of its ecological functions. In this phase, therefore, other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria."

89. Importantly, at each step outlined in ***Table 4.1***, the consideration of alternative solutions is not a speculative and hypothetical exercise by reference to an abstract "problem". It must be approached on a reasonable basis, with reference to the genuine project objectives, grounded in a real-world consideration of feasibility (legally, technically and commercially).

4.2 Step 1: Need for project and Project Objectives

90. UK (DEFRA 2012) and EC (EC 2001) guidance, uniformly indicate that, in order to identify potential "alternative solutions", the first step is to determine the need for and in consequence the key objectives of the project in question. It is from this starting point that it is possible to identify if there are a range of "alternative solutions" (i.e. alternative ways of meeting the project objectives). DEFRA (2012) guidance notes that "*alternative solutions are limited to those which would deliver the overall objective as the original proposal*".

91. Paragraphs 13 and 14 of the DEFRA guidance additionally advise "*that the competent authority must use its judgement to ensure that the framing of*

alternatives is reasonable by reference to the identified objectives, as they provide the context and set the scope for consideration of alternative solutions".

92. The need for the Project forms the overarching reason for the DCO application; this is set out above in ***Section 3*** of this report and detailed further ***in Chapter 2 Need for the Project*** of the Environmental Statement (APP-050). Only alternatives that meet or deliver the Project's need and objectives are considered in Step 4, which determines whether any shortlisted potential alternative solutions are 'feasible' alternative solutions.

4.2.1 Project Objectives of East Anglia ONE North

93. It is clear from the above that there is a need to deploy offshore wind at scale, and to urgently consent projects which are both deliverable before 2030 and affordable within the framework of the Government's policy of controlling cost to consumers, to materially contribute to the ever more urgent need to decarbonise the means of energy production to help mitigate the worst effects of climate change. This need drives the project and is reflected in the project objectives for the Project which are set out in ***Table 4.3*** below.

Table 4.3 Project Objectives of East Anglia ONE North

ID	Project Objective
1	To generate low carbon electricity from an offshore wind farm in support of the decarbonisation of the UK electricity supply in line with the urgent need set out in Overarching National Policy Statement for Energy (EN-1) and the National Policy Statement for Renewable Energy Infrastructure (EN-3), and contribute to the delivery of the Net Zero objective of the Climate Change Act (2050 Target Amendment) Order 2019
2	To export electricity to the UK National Grid to support UK commitments for offshore wind generation, contribute to security of supply and deliver low cost generation for the benefit of UK electricity consumers
3	To optimise generation and export capacity within the constraints of available sites and onshore transmission infrastructure
4	To deliver a significant volume of offshore wind energy in the 2020s to support the urgent need to achieve 40GW of offshore wind energy by 2030 in line with UK Government policy

4.3 Step 2: Project Design Parameters and Potential for Harm

94. ***Table 4.4*** lists the sites and features relevant to this derogation case and considered within this assessment of alternatives. The Project design parameters at the time of application submission that could be considered in the assessment of alternatives are detailed in ***Table 4.5***.

Table 4.4 Relevant European sites and features potentially affected

European Site	Qualifying feature	Relevant impact from Project
Flamborough and Filey Coast Special Protection Area	Kittiwake Gannet	In-combination collision risk
	Razorbill Guillemot	In-combination displacement risk
Outer Thames Estuary Special Protection Area	Red throated diver	Project alone displacement risk In-combination displacement risk
Alde-Ore Estuary Special Protection Area	Lesser black backed gull	In-combination collision risk

95. With respect to birds where the identified impact is collision risk arising from the operation of wind turbines, the primary project design parameters (see ***Table 4.5***) relevant to or which may influence collision risk during operation are:

(i) Array location (relative to SPA);
(ii) Number of turbines;
(iii) Maximum rotor swept area;
(iv) Height of turbine blades above sea surface; and
(v) Operational period.

96. In respect of birds where the identified impact is displacement risk during the operation of the Project, the project design parameters (see ***Table 4.5***) relevant to or which may influence displacement risk during operation are:

(i) Array location (relative to SPA),
(ii) Number of turbines,
(iii) Operational period.

Table 4.5 Relevant Project Design Parameters of Project at the time of Application Submission

Wind Turbine Generators (WTG) Specifications	EA1N
Nominal installed capacity (MW)	800
Maximum number of WTG	67
Maximum tip height from Lowest Astronomical Tide (LAT) (m)	282
Maximum hub height from LAT (m)	175
Maximum rotor diameter (m)	250
Minimum Spacing Crosswind (m)	800

Wind Turbine Generators (WTG) Specifications	EA1N
Minimum Spacing Downwind (m)	1,200
Minimum air draft above Mean High Water Spring (MHWS) (m)	22
Minimum distance to the Outer Thames Estuary SPA	2km

97. Changes (i.e. alternatives) to any other element of the project design parameters would have no bearing on collision or displacement risk for these features and cannot be alternative solutions.

98. In terms of layout, this is not considered to be relevant for the following reasons:

- Displacement is based upon the windfarm site boundary and buffers thereof. When considering project alone or in-combination effects it is simply the windfarm area (and associated buffer areas) that are considered, not the location of infrastructure within it. The assessment assumes that wind turbines could potentially be located right up to the boundary.
- Collision risk estimates are derived from consideration of the densities of each species within the site (derived from survey data collected within the boundary only), other species-specific parameters (e.g. flight height) and the turbine parameters (e.g. rotor diameter and draught height). These estimates are determined per wind turbine and multiplied by the number of turbines, the collision risk estimates do not consider spatial variations in the densities of birds across a site or the actual location of the wind turbines.

99. In terms of turbine size, the Applications considered two sizes of wind turbine considered to represent the range of likely turbine which would be deployed; a nominal 250m wind turbine and 300m wind turbine which translated in 67 (or 53) individual turbines. **Table 12.31** of ***Chapter 12 Offshore Ornithology*** (APP-060) illustrates, for the species assessed for collision risk, the difference between these scenarios in EIA terms (i.e. not apportioned to SPA populations). Although in most cases, the larger number of smaller turbines represented the worst case, this difference was in each case less than one individual bird (in EIA terms, which would then be greatly reduced when apportioned for HRA). The range of turbines within the project envelope is considered to be realistic and reflective of the advanced engagement with the supply chain.

100. In terms of the draught height, further refinements were considered and this is discussed detail in the ***Offshore Commitments*** (REP3-073) report and in ***section A.1.3*** of this document.

101. Amendments to the layout, turbine size and draught height are therefore not considered to be viable alternatives.

4.4 Step 3: Assessment of Alternatives

4.4.1 Stage 1: Do Nothing

102. DEFRA (2012) acknowledges that 'do nothing' (i.e. do not build) should be included for consideration of alternatives, but that it would not normally be considered acceptable as it would fail to deliver the project's objectives. Instead, it typically forms the baseline against which other alternatives can be assessed. The DEFRA (2012) guidance also states that the consideration of the 'do nothing' scenario can help in understanding the need for the proposal to proceed, which is relevant to any later consideration of the IROPI test.

103. Given that the targets for renewable energy within the UK do not have a set limit, a project cannot be ruled out on the basis that alternatives exist (in terms of alternative projects) – since all available offshore wind projects are required to meet 2030 targets. This is supported by the NPS EN-1 where it suggests that all suitable sites for energy infrastructure of the type proposed (i.e. offshore wind) may be needed for future proposals to deliver the objective of the project and contribute to relevant targets for renewable energy generation. More recently, the HRA for Hornsea Project Three (BEIS 2020a, section 11.3.1) states that:

"Not proceeding with the Project…..would not meet the Project objectives and would hinder the wider need to deploy offshore wind generation at scale, before 2030, to help the UK to meet its commitments under the Climate Change Act 2008 (as amended) to mitigate the effects of climate change"

"The Do Nothing alternative would further erode the capacity anticipated to be operational by 2030, putting additional reliance on as-yet unidentified projects to meet the Government's ambitions."

104. The urgent need to mitigate climate change by meeting the 'net zero' target and the consequent demand for deployment of offshore wind at a massive scale mean that 'do nothing' is not a realistic alternative option for the Project as it does not meet the project need nor does it deliver on any of the project objectives listed in ***Table 4.3***. This option can therefore be discounted as an alternative solution.

4.4.2 Stage 2: Alternative forms of energy generation

105. DEFRA (2012) guidance suggest that alternatives should be limited to those projects which deliver the same objectives as the proposed Project and in the case of offshore wind, the consideration of alternatives should be limited to alternative offshore wind sites, rather than alternative types of energy generation. This position was confirmed in the HRA for Hornsea Project Three (BEIS, 2020a section 11.2).

"In accordance with guidance published by DEFRA, the Secretary of State does not consider the development of alternative forms of energy generation to meet the objectives for the Project. Alternatives to the Project considered by the Secretary of State are consequently limited either to Do Nothing or to alternative wind farm projects"

106. As such, alternative forms of energy generation are not considered to be a feasible alternative solution.

4.4.3 Stage 3: Alternative Locations and Sites

4.4.3.1 Alternative Locations in other countries

107. Locations in other countries do not deliver on any of the UK specific project objectives, targets or policy in relation to carbon emission reductions, renewable energy generation, offshore wind generation, climate change or national policy in respect of which the Project objectives seek to contribute to. EU countries have different binding targets in respect of each of these. Therefore, projects outside the UK cannot count towards the UK need for additional offshore wind capacity. Other international and EU countries similarly have their own binding targets and projects outside the UK are required for other Member States and countries to achieve their own respective targets in respect of climate change and renewable energy.

108. Accordingly, consideration of proposals in different countries would not deliver on any of the Project objectives and as such are not a feasible alternative solution.

4.4.3.2 Feasible locations outside former East Anglia Zone

109. The process and factors which influence and constrain site selection and design are described in NPS EN-3 from paragraph 2.6.15 through to 2.6.35 and also discussed in ***section 4.7*** of ***Chapter 4 Site Selection and Assessment of Alternatives*** (**APP-052**).

4.4.3.2.1 Round 1 and 2 and Extensions and Scottish Territorial Waters

110. Locations identified by The Crown Estate (TCE) in leasing Rounds 1 and 2 and Extension sites and those identified in Scottish territorial waters are already under exclusivity to other offshore wind developers and subject to offshore wind developments which are operational, in construction, consented or in development.

111. Those locations are not legally available and as such do not meet project objective **ID3**. These projects have their own project objectives and form a critical component of satisfying the urgent need for renewable energy (all are needed in order to meet the Governments 40GW offshore wind target), and as such do not meet project objectives **ID1** or **ID4.**

4.4.3.2.2 Round 3 Zones

112. The Project is located within the former East Anglia Zone. The East Anglia Zone was one of nine offshore zones which formed part of the third leasing round for UK offshore wind farms. These zones were founded on an extensive and rigorous UK wide zone selection process undertaken over many years originally by the Government and TCE. The Round 3 Zones were the subject of an Offshore Strategic Environmental Assessment (OSEA) and as such the identified zones and sites were subject to considerable scrutiny before being open for lease. The location and boundaries of the former East Anglia Zone were determined by TCE and were beyond the control of the Applicant. Sites not within areas identified to date by the TCE are not legally available and as such do not meet project objective **ID3**.

113. In English and Welsh waters, TCE hold the exclusive right to grant licences for offshore wind farms under the Energy Act 2004. As noted in NPS EN-3, TCE identifies potential development areas in accordance with The Crown Estate Act 1961, Government policy, plans and associated OSEA work. Developers can only bid for the right to develop sites or zones made available by TCE.

114. Sites within other Round 3 Zones are under exclusivity to other offshore wind developers and subject to offshore wind developments which are consented or in development. These sites are not legally available to the applicant and as such do not meet project objective **ID3**. These projects have their own project objectives and form a critical component of satisfying the urgent need for renewable energy, and as such do not meet project objectives **ID1** or **ID4.**

115. All of the Round 3 projects currently planned or consented but not yet built are needed in order to meet the Governments 40GW offshore wind target and are therefore not feasible alternatives.

4.4.3.2.3 Round 4 and ScotWind

116. TCE Round 4 will make areas of seabed throughout English and Welsh waters available which have the potential for up to 7GW of generating capacity. The scale of this leasing round is significantly smaller than Round 3 (through which ScottishPower Renewables (SPR) (of which the Applicant is a wholly owned subsidiary) secured the East Anglia Zone). There will be no development 'zones' awarded, but rather individual projects with a maximum size of 1.5GW. This will be subject to a plan level HRA that has yet to be carried out and may affect the shape, scale and timing of development.

117. This leasing round is currently expected to end in the summer of 2022, when TCE will award contracts to the successful developers. When applying the typical development timescales, projects secured under this leasing round would be likely to commence construction only from the late 2020s and as such it would be

unlikely for these projects to contribute significantly to the 40GW target before 2030.

118. Of the UK Government commitment of 40GW of offshore wind by 2030, it is anticipated that 10GW of this will come from Scottish projects (Scottish Government 2019). The rest will be made up of projects in the rest of the UK. All projects are required to meet this target, therefore Scottish projects are not a feasible alternative as they are required in addition to other UK projects. Whilst it is acknowledged that Scotland is progressing its own offshore wind leasing round, known as ScotWind, the timescales of the ScotWind leasing round will again mean it would be unlikely for these projects to contribute significantly to the 40GW target before 2030.

119. These projects would therefore not meet project objective **ID4** of delivering renewable electricity from offshore wind in time to contribute towards the 2030 targets.

4.4.3.2.4 Cancelled projects

120. Several projects from the previous licencing rounds were not developed. The reasons were varied and range from being cancelled by the developer because of feasibility issues; to major consent risk being identified pre-application; to being refused consent. It is likely that the reasons projects were cancelled would still apply. In addition, given that data collected for these projects would be out of date and that consenting processes would be required to start from scratch, their development timescales would be as per Round 4 and ScotWind and therefore would not meet project objective **ID4** of delivering renewable electricity from offshore wind in time to contribute towards the 2030 targets.

4.4.3.3 Feasible locations within the former East Anglia Zone

4.4.3.3.1 Feasible locations within Northern Section of former East Anglia Zone

121. In 2010, TCE announced that SPR and Vattenfall were successful in securing the Round 3 site which was later to be called the East Anglia Zone. After successfully obtaining consent and a Contract for Difference (CfD) for East Anglia ONE, and successfully submitting the application for consent for East Anglia THREE (now consented), SPR and Vattenfall split the former East Anglia Zone. SPR agreed to develop the southern half of the former East Anglia Zone and Vattenfall agreed to develop the northern half of the former East Anglia Zone.

122. As such, the northern section is not legally available to SPR, and would not meet project objective **ID3**. In addition, Norfolk Boreas and Norfolk Vanguard which are being developed in the northern section are required to contribute towards the delivery of the 40GW target by 2030, therefore they are not an alternative and would not help to meet project **ID4**.

4.4.3.3.2 Feasible locations within Southern Section of former East Anglia Zone

123. The identification of discrete project sites within the former East Anglia Zone was carried out using the process of Zonal Appraisal and Planning (ZAP) as recommended by TCE specifically for Round 3 and endorsed within NPS EN-3. A ZAP exercise was carried out for the whole of the Zone and was a strategic, non-statutory approach to Zone design and project identification advocated by TCE. The main aims of the ZAP process were to:

- Optimise the development opportunity within each zone through the identification of initial boundaries for the most technically and environmentally suitable development sites;
- Assess cumulative and in-combination impacts across the entire zone and in relation to other nearby offshore windfarm developments and marine activities; and
- Encourage wider stakeholder engagement at a strategic level to help inform the longer-term development strategy.

124. The initial ZAP process for the East Anglia Zone comprised two key elements:

- Zonal Technical Appraisal (ZTA) – focusing on the key physical characteristics of the Zone e.g. water depth and sea bed geology; and
- Zonal Environmental Appraisal (ZEA) – focusing on key environmental, social and economic characteristics of the Zone.

125. The ZTA utilised data from zonal geophysical and geotechnical surveys, as well as from publicly available hydrographic and geological, to better understand the technical constraints within the zone. The ZEA utilised zonal data from environmental surveys (for example, ornithological surveys and benthic surveys) and desk-based assessments of publicly available and historical information.

126. From the review of the initial ZEA baseline in combination with technical constraints considered in the ZTA, potential Development Areas were identified as the least constrained parts of the former East Anglia Zone[14]. The potential development areas were further assessed in order to identify a smaller number of preferred development areas. A direct comparison of the environmental sensitivity of all areas was made using a high-level assessment. The most developable areas, i.e. those with the least number of potential issues and the lowest potential sensitivity were then identified.

127. As a result of this process, four projects were considered to have relatively low sensitivity. These were the East Anglia ONE, TWO, THREE and FOUR projects.

[14] Note that the ZAP included the northern section of the former Zone and identified the areas now known as Norfolk Vanguard and Norfolk Boreas as developable locations.

The southern part of East Anglia ONE and East Anglia THREE, were pursued first and as such, these locations are no longer available. East Anglia FOUR was in the northern section of the former Zone and now forms part of Norfolk Vanguard, therefore this location is no longer available.

128. The proposed East Anglia ONE North and East Anglia TWO sites are the most suitable remaining areas within the former East Anglia Zone. Other locations within the southern portion of the East Anglia Zone cannot be considered as an alternative to East Anglia TWO and East Anglia ONE North as they are less technically and environmentally feasible locations, hence have not been pursued.

4.4.3.3.2.1 East Anglia ONE North Site selection

129. The East Anglia ONE North windfarm site boundary has been selected on the basis of the ZAP process detailed above and further consideration of development potential carried out by the Applicant. The shape of the East Anglia ONE North windfarm site boundary was informed by surrounding constraints. The boundary was delineated by the Outer Thames Estuary SPA to the west, proximity to East Anglia ONE (1km south), shipping and navigation activity, as well as the proximity to a series of telecommunications cables to the north and the former East Anglia Zone boundary to the west.

4.4.3.3.2.2East Anglia TWO as an alternative location

130. As noted above, East Anglia ONE North and East Anglia TWO are the most suitable remaining sites within the southern portion of the East Anglia Zone. East Anglia TWO cannot be considered as an alternative to East Anglia ONE North (and vice versa) as all projects consented and in planning are needed to meet the 40GW target by 2030. This option does not deliver on project objective **ID4.**

4.4.3.4 Summary of alternative locations and sites

131. There are no feasible alternative locations or sites either inside or outside the former East Anglia Zone for the reasons discussed above and summarised in ***Table 4.6*** below.

Table 4.6 Summary of alternative locations and sites

Alternative Location		Reason alternative option discounted.
In other countries		Does not deliver any of the of the project objectives and as such, this is not a feasible alternative.
Outside former East Anglia Zone	Round 1 and 2 and Extensions, Scottish Territorial Waters sites	Locations identified by TCE in prior leasing Rounds are already under exclusivity to other offshore wind developers and subject to offshore wind developments which are operational, in construction, consented or in development. These locations are not legally available and as such do not meet project objective ID3.

Alternative Location		Reason alternative option discounted.
	Round 3	Developers can only bid for the right to develop sites or zones made available by TCE. The location and boundaries of the former East Anglia Zone were determined by TCE. Sites not within areas identified to date by the TCE are not legally available and as such do not meet project objective ID3. All Round 3 projects consented or in planning (but not under construction) are required to meet the 2030 target, aligning with project objective ID4 and are therefore not feasible alternatives.
	Round 4 and ScotWind	Round 4 and ScotWind projects are very unlikely to be generating power on any scale before 2030 and would not address project objective ID4.
	Cancelled projects	Reasons for cancellation likely to still apply. In addition, if brought forward they would not be generating power on any scale before 2030 and would not address project objective ID4.
Within former East Anglia Zone	Northern section of Zone	Sites are not legally available and as such do not meet project objective ID3. Norfolk Vanguard and Norfolk Boreas are required to meet the 2030 target, aligning with project objective ID4
	Southern section of Zone	East Anglia ONE and East Anglia THREE areas not available. Other locations within the southern portion of the East Anglia Zone cannot be considered as an alternative to East Anglia TWO and East Anglia ONE North as they are less technically and environmentally feasible locations or would not avoid or have lesser effect on the integrity of any European site.
	East Anglia ONE North	All Round 3 projects consented or in planning (but not under construction), including East Anglia ONE North are required to meet the 2030 target, aligning with project objective ID4

4.4.4 Stage 4: Alternative Design

132. In developing the project design envelope (or Rochdale Envelope) for the Project, careful and extensive consideration of alternatives and different scales and designs of development were assessed.

133. The project design envelope sets out a series of realistic design assumptions from which worst case parameters are drawn for the proposed project. The project design envelope has a reasoned maximum extent for a number of key parameters. The final design would lie within the maximum extent of the consent sought. The project design envelope is used to establish the maximum extent to which the proposed project could impact on the environment. The detailed design of the proposed project could then vary within this 'envelope' without rendering the assessment inadequate.

134. The general principle of the assessment is that for each receptor topic, the impact assessment is based on a range of project design parameters (e.g. the maximum tip height of wind turbines that could be installed would be 300m above lowest astronomical tide (LAT) with a maximum rotor diameter of 250m), the key being that those parameters selected represent the range of options within which the greatest environmental impact would occur. The end result is an Environmental Impact Assessment (EIA) based on clearly defined environmental parameters that would govern or define the full range of development possibilities and hence the likely environmental impacts that could flow from the grant of development consent.

135. In relation to the project design, the Applicant has stated its position in the ISAA (APP-043) that no AEoI applies to all sites/features detailed in ***Table 1.1***. Nevertheless, since the submission of the application, the Applicant has reviewed the project design envelope with regard to the representations of Interested Parties, particularly where there are concerns with Habitats Regulations issues. Those parameters where there were options for amendment have been reviewed to determine what changes are possible and practical, and fit within the definitions of feasibility from ***Table 4.2***. These changes are presented in ***Table 4.7*** and are commitments that the Applicant has now made and will be reflected in revisions to the draft DCO and associated documents. Further detail on these changes is presented in the **Offshore Commitments** document submitted at Deadline 3 (REP3-073). Further detail on the implications of these changes for the effects upon the features can be found in ***Offshore Ornithology Cumulative and In Combination Collision Risk Update*** (REP1-047) and Displacement of red-throated divers in the Outer Thames SPA submitted at Deadline 6 (document reference ExA.AS-10.D6.V3).

Table 4.7 Summary of changes to project design envelope since application and implications for effects on features of concern

Design Change	Implication for Project effects
Collision risk	
Increased minimum turbine draught height	• Supply chain analysis and early works for the procurement of East Anglia Hub have determined that an increase in draught height by 2m is feasible. The rationale for this commitment is provided in ***Offshore Commitments*** (document reference REP3-073) (largely reproduced in ***section A.1.3***) • This reduces collisions by raising the rotor to heights where bird densities are lower due to the skewed nature of bird flight height distribution (Johnston et al., 2014). • An increase in turbine draught height by 2m reduces the collision risk contribution of the Project by the following (see REP1-047):

Design Change	Implication for Project effects
	o Kittiwake 8% o Gannet 12% o Lesser black-backed gull 5%
Decrease in wind turbine tip height	• Supply chain analysis and early works for the procurement of East Anglia Hub have determined that the maximum tip height of wind turbines that will be available within the construction timeframes of the Project is 282m above LAT. Accordingly, the wind turbine maximum tip height parameter has been reduced by 18m from the previous maximum of 300m and the Draft DCO submitted at Deadline 3 has been updated to reflect the maximum tip height of 282m above LAT. • This change is neutral with respect to collision risk to birds as the rotor diameter remains at 250m.
Displacement	
Reducing the size of the windfarm site to increase the distance to the Outer Thames Estuary SPA.	• A review of site conditions data, existing and future constraints and other requirements have determined that the East Anglia ONE North windfarm site can be reduced at its western end to increase the distance to the boundary of the Outer Thames Estuary SPA to a minimum of 2km. The rationale for this commitment is provided in ***Offshore Commitments*** (document reference REP3-073 (reproduced in Appendix 1); and • This reduction in the size of the windfarm site will reduce displacement by 8% (see document reference ExA.AS-10.D6.V3 submitted at Deadline 6).

136. The feasibility of alternative project designs and means of operation that could further reduce effects upon the European sites have been considered in ***Table 4.8***.

Table 4.8 Assessment of alternative scales, designs and means of operation and identification of the feasibility of the identified alternatives

Alternative scale or design	Does option meet project: Need	Does option meet project: Objective	Rationale for need / objective response	Is this option feasible?
Reduce turbine numbers to less than 67 retaining overall project capacity	Yes	Yes	Installing fewer higher capacity turbines has the potential to produce the same overall energy yield. This has been assessed in	No. The turbine number is based on the maximum number of the smallest wind turbine anticipated to be commercially available within the construction timeframe. Further refinement outside of what will be available within the

Alternative scale or design	Does option meet project: Need	Does option meet project: Objective	Rationale for need / objective response	Is this option feasible?
			the design scenario.	timeframe would risk delivery against objective ID4 and the 2030 target. In addition, as discussed in **paragraph 99**, modelling showed that within the range of options available changing turbine number/size made little difference (i.e. <1 individual of any species in EIA terms, reduced further when apportioned for HRA)
Reduce turbine numbers to less than 67 reducing overall project capacity	Yes	No	Installing fewer lower capacity turbines would decrease the Project's energy yield	No A reduction in turbine numbers would reduce the overall capacity of the Project, this would fail to meet objective ID3 by not optimising capacity. In addition, this would reduce the ability to meet objective ID4 as it would reduce the project's contribution to the 40GW target. The UK needs the maximum size of projects to be constructed. Any reduction in project capacity will reduce the chance of meeting this target.
Use fewer larger capacity and size (i.e. greater than the Rochdale Envelope) wind turbines	Yes	Yes	Installing fewer higher capacity and physically larger turbines has the potential to produce the same overall energy yield.	No The project design envelope was designed with a range of likely available technologies in mind, with turbines up to 300m in height (reduced to 282m post-application). Although the Applicant notes that larger turbines have been proposed for other projects, these are not considered viable for the Project in terms of their commercial availability and sufficient supplier capacity within the construction timeframe. Further refinement outside of what will be available within the timeframe would risk delivery against objective ID4 and the 2030 target.
Increase minimum draught height	Yes	Yes	The minimum air draught of 22m MHWS is set by	No Increasing air-draught beyond the commitment made to 24m above

Alternative scale or design	Does option meet project: Need	Does option meet project: Objective	Rationale for need / objective response	Is this option feasible?
			navigation requirements. This has been raised by 2m to reduce collision risk for those birds flying between the sea surface and 24m above MHWS.	MHWS would have further implications on technical aspects (tower weight and foundation requirements) and commercial implications. Although other projects in the Southern North Sea have committed to increasing draught height by greater than 2m the circumstances at those locations may be different in relation to the following: Site conditions; principally water depth. Also underlying seabed geology, and seabed morphology, such as the occurrence of mobile sand waves Layout constraints including the occurrence of archaeology and sensitive seabed communities such as reefs. These points are covered in detail in document reference ExA.AS-21.D3.V1 submitted at Deadline 3. Changes that increase the Project's costs risk the delivery of low cost generation for the benefit of UK electricity consumers under objective ID2.
Increasing the distance to the Outer Thames Estuary SPA beyond the minimum 2km buffer already applied post-application	Yes	No	This alternative would increase the buffer zone between the SPA and turbines and potentially reduce displacement effects	No The Applicant considered the application of buffers of greater than 2km and concluded that due to the relatively small area of the windfarm site, existing and known future constraints in addition to unknown future constraints such as archaeology and *Sabellaria spinulosa* reefs, a further reduction in the area of the windfarm site would reduce the overall capacity of the Project and affect commercial viability in terms of residual cost per MW. This would reduce the ability to meet objective ID4

Alternative scale or design	Does option meet project: Need	Does option meet project: Objective	Rationale for need / objective response	Is this option feasible?
				as it would reduce the Project's contribution to the 2030 target. The UK needs the maximum size of projects to be constructed. Any reduction in project capacity will reduce the chance of meeting this target. Changes that affect the Project's costs risk the delivery of low cost generation for the benefit of UK electricity consumers under objective ID2.
Alternative means of operations	No	No	Turning turbines off during peak times (i.e. during breeding season).	In order for seasonal restrictions for turbine operation to have any material effect on the number of predicted collisions of kittiwake from the FFC SPA, shutdown of all the turbines for the Project would need to occur for several months of the year. Furthermore, since the contribution of the Project to the in-combination collision risk total is already small (0.41%), it follows that the degree of reduction to the in-combination total that would be achieved through turbine shutdown in the month with the largest collision risk (April) would be even smaller (0.19%) With GB electricity demand projected to grow 5% by 2030 and increasing to 30 and 50% by 2050 (National Grid 2019) and given the urgent need for renewable energy established within the NPSs in view of the need to meet climate targets, it is clear that all power generating plants need to be delivering at their optimal level. This option would reduce the electricity output and would significantly reduce the overall capacity of the Project. For these reasons this is not a feasible alternative on financial grounds, as turning turbines off at peak times would make the projects unviable. This would affect the project's ability to meet the project

Alternative scale or design	Does option meet project: Need	Does option meet project: Objective	Rationale for need / objective response	Is this option feasible?
				need and meet project objectives ID2 and ID4.

4.5 Summary of Alternatives

137. The purpose of this report has been to demonstrate objectively to the planning inspectorate that there are no feasible alternative solutions to the Project.

138. Potential alternative solutions have been identified and considered as part of this Stage 3 HRA assessment. The assessment of alternative solutions provided in this report demonstrates that there are no feasible alternative solutions that would have a lesser effect on the integrity of the European sites noted in ***section 4.2.1***. The conclusions of this assessment have been summarised in ***Table 4.9*** below.

Table 4.9 Summary of alternatives solutions that have been discounted.

Design Alternative	Alternative Option Considered	Reason Alternative Option Discounted
Not having the Project (see ***section 4.4.1***)	Not progressing the Project	Does not deliver any of the Project objectives and is therefore not feasible alternative.
Alternative form energy generation (see ***section 4.4.2***)	None considered	Not required
Alternative Location	Locations outside the UK	Do not deliver any of the of the Project objectives.

Design Alternative	Alternative Option Considered	Reason Alternative Option Discounted
(see ***section 4.4.3***)	Other locations in the UK (see ***Table 4.6)***	Locations identified by TCE in prior leasing Rounds are already under exclusivity to other offshore wind developers and subject to offshore wind developments which are operational, in construction consented or in development. These locations are not legally available and as such do not meet Project objective **ID3**. All Round 3 projects consented or in planning (but not under construction) are required to meet the 2030 target, aligning with Project objective **ID4** Round 4 and ScotWind projects are very unlikely to be generating power on any scale before 2030 and would not address Project objective **ID4**.
Alternative scales or designs or means of operation (see ***section 4.4.4***)	Alternatives that reduce Project capacity	Any change that reduces capacity does not meet Project objective **ID4**
	Alternative designs within Project capacity	**Table 4.7** lists the changes made to the project design envelope, further changes are not considered feasible (see **Table 4.8**).

4.6 Step 5: Assessment of Effects of Feasible Alternative Solutions on Natura 2000 sites

139. Step 5 is not applicable, as there are no feasible alternative solutions to the revised Rochdale Envelope presented in ***Table 4.7***.

4.7 Assessment of Alternatives conclusions

140. Alternative solutions for the Project have been assessed in an iterative manner as per the approach shown in ***Table 4.1***. The Do Nothing, Alternative Forms of energy Generation and Alternative Location options have been examined and discounted (see ***section 4.4.1*** to ***section 4.4.3***). The project design envelope has been revised as discussed in ***section 4.4.4***, and as a result there is no further feasible refinement available that would reduce effects upon the features and potential for Adverse Effect on Integrity of the Flamborough and Filey Coast SPA, Alde-Ore Estuary SPA and Outer Thames Estuary SPA.

5 Imperative Reasons of Overriding Public Interest (IROPI)

5.1 Approach to assessing IROPI

141. The precise parameters of IROPI are not fixed or defined by the Habitats Directive. Likewise, the sources of guidance on IROPI (detailed in ***section 2*** of this report) do not provide a methodology for the assessment of IROPI, however they do identify key points to consider.

142. Planning Inspectorate Advice Note 10 states that, where adverse effects on the integrity of European site(s) are predicted to arise as a result of the project (alone or in combination with other plans or projects) and it can be demonstrated that there are no alternative solutions to the project that would have a lesser effect or avoid an adverse effect on the integrity of the European site(s), the project may still be carried out if the competent authority is satisfied that the scheme must be carried out for IROPI. In the case of the Project, the Competent Authority that has the final decision on IROPI will be the SoS for BEIS.

143. The parameters of IROPI are explored in guidance provided by DEFRA (2012) and the European Commission (2019), which identify the following principles defined in ***section 2.4.4***. The DEFRA (2012) Guidance – which itself is based on the EC's (2012) Guidance on Article 6(4) of the Habitats Directive identifies that consideration of the objective of the plan or project is central to the determination of IROPI. The need for and objectives of the Project are detailed in ***section 3*** of this report and further discussed and expanded upon in ***Chapter 5*** of the ***Development Consent and Planning Statement*** (APP-579) and ***Chapter 2 Need for the Project*** (APP-050) of the project Environmental Statement. The IROPI position in respect of the Project is premised on its social and economic benefit, with appropriate recognition that the Project will deliver:

- Low carbon energy, which is of benefit to the environment generally; and
- Consistent and reliable energy supply, which is essential to maintaining a good standard of human health and public safety.

144. The approach to presenting the Project's case for imperative reasons of overriding public interest consists of answering the following questions:

1) Are the reasons for undertaking the project **imperative**?
2) Are the reasons in the **public interest**?
3) Are the reasons **long term**?
4) Are the reasons for undertaking the plan or project **overriding**?

5.2 The IROPI Test

5.2.1 Are the reasons for undertaking the project imperative?

145. This question is answered by reference to the BEIS (2020a) synthesis (see ***section 2.4.4***).

"Urgency and importance: There would usually be urgency to the objective(s) and it must be considered "indispensable" or "essential" (i.e. imperative). In practical terms, this can be evidenced where the objective falls within a framework for one or more of the following:

Actions or policies aiming to protect fundamental values for citizens' life (health, safety, environment);"

146. There is an urgent need to reduce greenhouse gas emissions in the UK to reduce the rate of anthropogenic climate change. IPCC (2018) states that any path to limiting global warming to less than 1.5°C will require significant emissions reductions before 2030. In 2019 the Parliament declared a 'climate change emergency' and updated the target in the Climate Change Act 2008 target from an 80% reduction in carbon emissions by 2050, to net zero greenhouse gas emissions by the same date. In addition, the Overarching Energy NPS EN-1 is clear that the need for new renewable electricity generation projects is "*urgent*" (paragraph 3.4.5).

147. As described in ***Table 3.1*** impacts associated with climate changes affect terrestrial and marine ecosystems, coastal process and climate, water resources and flood risk and food security all of which directly or indirectly affect citizen's health, safety and environment.

148. There is therefore an imperative need for the Project to go ahead so that it can contribute to the 2030 targets and help deliver net zero greenhouse gas emissions.

"Fundamental policies for the State and the Society"

149. In order to meet UK climate change targets and energy demand, there needs to be an increase in electricity generation in the UK from low carbon sources against the backdrop of a continual reduction in the reliance on fossil fuels, nuclear power plants reaching end of life, and the delays in the build-out of nuclear and tidal energy schemes.

150. Supporting the development of offshore wind generating capacity will help the UK increase its contribution to combating global climate change. Over the next decade, there will need to be a huge expansion of offshore wind from the current 9.7GW that is in operation in the UK at present to achieve the UK Government target of 40GW of installed offshore wind by 2030. The Project is a major

infrastructure project which could meet approximately 5% of the current gap between operational, in -construction and other consented projects and the 40GW target, with potential to generate enough green electricity to power 800,000 UK homes. Offshore wind projects have taken a long time to develop in the UK – typically a period of 10 years from concept to generating electricity so projects consented now are imperative to achieving the longer term 2030 targets.

151. The project would therefore help to meet targets associated with fundamental policies of the state as detailed in ***section 3.2.2***, including the Climate Change Act 2008 (2050 Target Amendment) Order 2019, Clean Growth Strategy (BEIS 2017) and the 'Ten Point Plan for Green Industrial Revolution' target of 40GW of offshore wind by 2030.

"Activities of an economic or social nature, fulfilling specific obligations of public service."

152. As described above the project is an economic activity fulfilling clear public service obligations through the contribution to the 2030 targets and will help deliver net zero greenhouse gas emissions.

5.2.1.1 Conclusion on Imperative

153. The Project is imperative as evidenced by the Project objectives **falling within all the frameworks** described above.

5.2.2 Are the reasons in the public interest?

154. This question is answered by reference to the synthesis from ***section 2.4.4***.

"The interest must be a public rather than a solely private interest (although a private interest can coincide with delivery of a public objective)."

155. The need for the Project can be traced directly back to both national and international policies to meet the need for energy generation and combat anthropogenic climate change. The DEFRA (2012) guidance notes that projects which enact or are consistent with national strategic plans or policies (e.g. covered by or consistent with a NPS or identified within the National Infrastructure Plan) are more likely to show a high level of public interest. Established policy is clear that in the context of the imperative need in each of the objectives of combatting anthropogenic climate change by meeting 2030 targets, delivering low cost energy and ensuring security of supply, offshore wind has a critical role to play. The Project is capable of providing a significant contribution to these urgent objectives.

156. It is also analogous with precedent in many NSIP DCO decisions for offshore wind farms which confirm that a *"compelling case in the public interest"* is made, justifying the granting of powers of compulsory acquisition of land (under section

122 of The Planning Act 2008), where, all other things being equal, an application makes a valid case for development consent.

157. Public interest is further demonstrated in that the basis of all DCO decisions is the body of designated NPSs and that the process of designating NPSs involved a plan-level HRA process of its own, which without prejudice to the findings of any project specific HRA, established that there are imperative reasons of overriding public importance of the renewable energy programme of which the Project is a component part. This is made clear in paragraph 1.7.13 of NPS EN-1:

"Habitats Regulation Assessments (HRA) have been carried out and published for the non-locationally specific NPSs EN-1 to EN-5 and for EN-6 which does specify sites suitable for development. As EN-1 to EN-5 do not specify locations for energy infrastructure, the HRA is a high-level strategic overview. Although the lack of spatial information within the EN-1 to EN-5 made it impossible to reach certainty on the effect of the plan on the integrity of any European Site, the potential for proposed energy infrastructure projects of the kind contemplated by EN-1 to EN-5 to have adverse effects on the integrity of such sites cannot be ruled out. The HRA explains why the Government considers that EN-1 to EN-5 are, nevertheless, justified by imperative reasons of overriding public interest, while noting that its conclusions are only applicable at the NPS level and are without prejudice to any project-level HRA, which may result in the refusal of consent for a particular application".

158. The Government's strategy to exploit the UK's offshore wind resource to produce renewable energy, and to identify and develop offshore sites such as the Round 3 Zones (which includes the former East Anglia Zone) for that purpose, is a fundamental, national policy pursued within a clear framework which seeks to protect the environment and human health from the consequences of climate change and promote public safety.

159. Whilst the policy drivers for offshore wind lie in the public interest, the delivery of that public interest is delivered by private companies such as Scottish Power Renewables. The EC (2019) guidance acknowledges that it is the nature of the interest, not the party promoting that interest, that must be public*: "As regards the 'other imperative reasons of overriding public interest' of social or economic nature, it is clear from the wording that only public interests, irrespective of whether they are promoted either by public or private bodies, can be balanced against the conservation aims of the Directive."*

160. Whilst the majority of this document has focussed on climate change the other public interest issues, particularly around economics should not be forgotten, although they may be considered subsidiary to other concerns. The Sector Deal

(BEIS 2019) estimates that building up to 30GW of offshore wind by 2030 could account for over £40bn of infrastructure spending in the next decade and could support 27,000 jobs. This is then extended by the Ten Point Plan for a 'Green Industrial Revolution' as announced by the Government in November 2020 which states that up to 60,000 jobs are to be supported in the offshore wind industry.

161. In response to the Sector Deal, the offshore wind sector has set a target of 60% lifetime UK content in domestic projects and targeting increasing UK content in the capital expenditure phase (BEIS 2019).

162. The Industrial Strategy (BEIS 2018) set out the goal of helping UK communities prosper and thrive. The offshore wind sector presents opportunities to create growth and economic benefits, particularly in coastal areas adapting to economic change. Regional clusters are already emerging, generally located close to windfarms or areas an oil and gas presence, such as East Anglia. Linking the clusters with educational institutions, centres for innovation or manufacturing bases can provide the conditions for innovation, drive competitiveness, increase economies of scale and productivity. The Sector Deal proposes capitalising on naturally existing clusters and providing sector leadership to create more opportunities for investment and growth in local economies (BEIS 2019). The Project will provide substantial benefits to the UK economy facilitating confidence in the UK supply chain and growing a skilled workforce as well as providing more local benefits through job opportunities and skills improvements.

163. The Government has declared that it is imperative in the aftermath of the coronavirus pandemic to *"build back better",* highlighting the fight against climate change and whilst supporting green jobs (HM Government 2020). As previously discussed, the Project would form a significant part of the 2030 plans and is perfectly aligned with this goal.

5.2.2.1 Conclusion on Public Interest

164. While the Applicant is a private company, in pursuing and seeking to deliver national and international public policy objectives, the public interest requirement is met. In addition to the delivery of long term, affordable low carbon energy, the Project will deliver public benefits such as employment, educational enhancement and infrastructure improvements in line with the wider Industrial Strategy.

5.2.3 Are the reasons long term?

165. This question is answered by reference to the definition from ***section 2.4.4****.*

"The interest would generally be long-term; short-term interests are unlikely to be regarded as overriding because the conservation objectives of the Habitats and Birds Directives are long term interests."

166. EC (2001) guidance is clear that public interest can only be overriding if it is long-term. There can be no doubt that the public interest served by the Project is long term. Offshore wind has a critical role to play, in delivering long term, cost effective, UK based low carbon electricity. The Project will be capable of contributing electricity generation to the National Grid by producing low cost, clean energy throughout its operational life.

5.2.3.1 Conclusion on Long Term

167. The project will play a key role in decarbonising the UK's power system and increasing security of energy supply in the UK and delivering energy independence, both of which are in the long-term public interest.

5.2.4 Are the reasons for undertaking the plan or project overriding?

168. This question is answered by reference to the definition from ***section 2.4.4***.

"The public interest of development must be greater than the public interest of conservation of the relevant European site(s)."

169. The relevant public interests relating to the project must be set against the weight of the interests protected by the Birds and Habitats Directives, having regard to the nature and extent of the harm identified to the relevant European sites. The effects upon the designated sites of concern are as follows[15]:

- The collision risk modelling (REP1-047) demonstrates that the collision risk estimate for kittiwake apportioned to the FFC SPA from the Project is 2.4 birds from an in-combination total of 585.6 (with Hornsea Projects 3 and 4, or 356.6 without) which represents 0.41-0.67% of the in-combination total.
- The collision risk modelling (REP1-047) demonstrates that the collision risk estimate for gannet apportioned to the FFC SPA from the Project is 10.4 birds from an in-combination total of 348.9 (with Hornsea Projects 3 and 4, or 277.3 without) which represents 2.98-3.75% of the in-combination total.
- The collision risk modelling (REP1-047) demonstrates that the collision risk estimate for lesser black backed gull apportioned to the AOE SPA from the Project is 0.19 birds from an in-combination total of 51.4 which represents 0.37% of the in-combination total.
- The displacement modelling submitted at Deadline 3 (document reference ExA.AS-4.D3.V1) demonstrates that between 9 and 34 red-throated diver could be displaced within the Outer Thames Estuary SPA by the Project alone (approximately 0.05 – 0.2% of the population[16]) this effect would cover 2.3% of the SPA, which when the gradient of effect predicted by the modelling is

[15] For consistency with REP1-047, the following percentages for in-combination reflect the proposed NMC of East Anglia THREE and East Anglia ONE. These numbers will be reviewed for subsequent submission of this document should it be considered necessary.
[16] Based on the nominal modelled population of 20,000

applied equates to 0.4-0.5% of SPA 'effective habitat loss'. It is the Applicants position that in-combination effects from existing projects such as London array should be included as part of the baseline, however if these are considered within the in-combination then the this effect would cover 31% of the SPA, which when the gradient of effect predicted by the modelling is applied equates to 5 -5.2% of SPA 'effective habitat loss'. Given that the red-throated diver population of the SPA is stable (and likely increasing), the Applicants consider that the displacement effect is not having an ecological consequence either for the Project alone or in-combination case.

170. The overriding nature of the public interests engaged in this case should be evident from the suite of legislation and policy documentation which has been outlined in this document. The Project would deliver benefits relating to human health, public safety and beneficial consequences of primary importance for the environment. It is also clear, as set out earlier in this document, that without achieving the overriding objective of reducing carbon emissions there is likely to be very significant species loss, including of wild birds and their prey.

171. It is recognised that IROPI is considered against the risk to a designated feature(s), having regard to the nature and extent of the harm identified to relevant European sites. In its contribution to reaching Net Zero and the associated fight against climate change, the Project will provide considerable long-term environment benefits, including benefits to the individual bird species within the SPAs.

172. Key drivers of seabird population size in western Europe are climate change (Sandvik et al. 2012; Frederiksen et al. 2004, 2013; Burthe et al. 2014; Macdonald et al. 2015; Furness 2016; JNCC 2016), and fisheries (Tasker et al. 2000; Frederiksen et al. 2004; Ratcliffe 2004; Carroll et al. 2017; Sydeman et al. 2017). Pollutants (including oil, persistent organic pollutants, plastics), alien mammal predators at colonies, disease, and loss of nesting habitat also impact on seabird populations but are generally much less important and often more local factors (Ratcliffe 2004; Votier et al. 2005, 2008; JNCC 2016).

173. Trends in seabird numbers in breeding populations are better known, and better understood than trends in numbers at sea within particular areas. Breeding numbers are regularly monitored at many colonies (JNCC 2016), and in the British Isles there have been three comprehensive censuses of breeding seabirds in 1969-70, 1985-88 and 1998-2002 (Mitchell et al. 2004) as well as single-species surveys (such as the decadal counts of breeding gannet numbers, Murray et al. 2015). In contrast, the European Seabirds at Sea database is incomplete, and few data have been added since 2000, so that current trends in numbers at sea in areas of the North Sea are not so easy to assess.

174. Breeding numbers of many seabird species in the British Isles are declining, especially in the northern North Sea (Foster and Marrs 2012; Macdonald et al. 2015; JNCC 2016). The most striking exception is gannet, which continues to increase (Murray et al. 2015), although the rate of increase has been slowing (Murray et al. 2015). These trends in British seabird populations seem likely to continue in the short to medium term future.

175. Climate change is likely to be the strongest influence on seabird populations in coming years, with anticipated deterioration in conditions for breeding and survival for most species of seabirds (Burthe et al. 2014; Macdonald et al. 2015; Capuzzo et al. 2018) and therefore further declines in numbers are anticipated. It is therefore highly likely that breeding numbers of most of our seabird species will continue to decline under a scenario with continuing climate change due to increasing levels of greenhouse gases. Fisheries management is also likely to influence future numbers in seabird populations. The Common Fisheries Policy Landings Obligation ('discard ban') will further reduce food supply for scavenging seabirds such as lesser black-backed gulls, kittiwakes and gannets (Votier et al. 2004; Bicknell et al. 2013; Votier et al. 2013; Foster et al. 2017). Recent changes in fisheries management that aid recovery of predatory fish stock biomass are likely to further reduce food supply for seabirds that feed primarily on small fish such as sandeels, as those small fish are major prey of large predatory fish. Therefore, anticipated future increases in predatory fish abundance resulting from improved management to constrain fishing mortality on those commercially important species at more sustainable levels than in the past are likely to cause further declines in stocks of small pelagic seabird 'food-fish' such as sandeels (Frederiksen et al. 2007; Macdonald et al. 2015). Lindegren et al. (2018) concluded that sandeel stocks in the North Sea, the most important prey fish stock for North Sea seabirds during the breeding season (Furness and Tasker 2000), have been depleted by high levels of fishing effort. These stocks are unlikely to recover fully even if fishing effort was reduced, because climate change has altered the North Sea food web to the detriment of productivity of fish populations. As a result, seabird populations are likely to continue to experience food shortages in the North Sea, especially for those species most dependent on sandeels as food.

176. Future decreases in kittiwake breeding numbers are likely to be particularly pronounced, as kittiwakes are very sensitive to climate change (Frederiksen et al. 2013; Carroll et al. 2015). Climate change has been linked with an 87% decline in breeding kittiwakes on Orkney and Shetland, and by 96% at St Kilda since 2007 (RSPB, 2017).

177. Kittiwakes are also sensitive to fishery impacts on sandeel stocks near breeding colonies (Frederiksen et al. 2004; Carroll et al. 2017), and the species will lose

the opportunity to feed on fishery discards as the Landings Obligation comes into effect.

178. Gannet numbers may continue to increase for some years, but evidence suggests that this increase is already slowing (Murray et al. 2015), and numbers may peak not too far into the future. While the Landings Obligation will reduce discard availability to gannets in European waters, in recent years increasing proportions of adult gannets have wintered in west African waters rather than in UK waters (Kubetzki et al. 2009), probably because there are large amounts of fish discarded by west African trawl fisheries and decreasing amounts available in the North Sea (Kubetzki et al. 2009; Garthe et al. 2012). The flexible behaviour and diet of gannets probably reduces their vulnerability to changes in fishery practices or to climate change impacts on fish communities (Garthe et al. 2012).

179. Most of the red-throated divers wintering in the southern North Sea originate from breeding areas at high latitudes in Scandinavia and Russia. Numbers of red-throated divers wintering in the southern North Sea may possibly decrease in future if warming conditions make the Baltic Sea more favourable as a wintering area for those species so that they do not need to migrate as far as UK waters. There has been a trend of increasing numbers of red-throated divers remaining in the Baltic Sea overwinter (Mendel et al. 2008; Fox et al. 2016; Ost et al. 2016) and decreasing numbers coming to the UK (Austin and Rehfisch 2005; Pearce-Higgins and Holt 2013), and that trend is likely to continue, although to an uncertain extent.

180. It is likely that further redistribution of breeding lesser black-backed gulls will occur into urban environments (Rock and Vaughan 2013), although it is unclear how the balance between terrestrial and marine feeding by these gulls may alter over coming years; that may depend greatly on the consequences of Brexit for UK fisheries and farming. Some of the human impacts on seabirds are amenable to effective mitigation (Ratcliffe et al. 2009; Brooke et al. 2018), but the scale of efforts to reduce these impacts on seabird populations has been small by comparison with the major influences of climate change and fisheries. This is likely to continue to be the case in future, and the conclusion must be that with the probable exception of gannet, numbers of almost all other seabird species in the UK North Sea region will most likely be on a downward trend over the next few decades, due to population declines, redistributions or a combination of both.

181. Climate change has been identified as the strongest influence on future seabird population trends. The recent EU funded SEANSE project[17] has assessed the

[17] The general objective of the SEANSE project is: “to develop a coherent (logical and well-organised) approach to Strategic Environmental Assessments (SEAs) with a focus on renewable energy in support of the development and effective implementation of MSPs”
https://www.msp-platform.eu/projects/strategic-environmental-assessment-north-seas-energy-seanse

impact of climate change on key seabird species (Rijkswaterstaat Zee & Delta 2020). The research concluded that **prey availability effects due to climate change is the pressure/pathway that currently has the largest impact on seabird population** at the wider North Sea level, and is likely to be responsible for a substantially greater effect than impacts resulting from any of the other activities (including collision risk or displacement form offshore wind). The report states *"it is concluded that prey availability effects due to climate change is the pressure/pathway that in the present day appears to have the largest impact on kittiwake…and lesser black-backed gull at the wider North Sea level, and is likely to be responsible for a substantially greater effect than impacts resulting from any of the other activities. For all seabirds it is largely expected that climate change impacts will become more severe in the future as both temperatures, and possibly the rate of increase, become greater, and extreme weather events become more frequent."*

5.2.4.1 Conclusion on Overriding

182. The Project would provide a benefit in the long term to individual bird species across their range through its objective to decarbonize the economy to help the UK combat global climate change. Hence the broadscale benefits would clearly outweigh the harm of small-scale, localised effects on specific SPAs.

5.3 Summary and Conclusions

183. This report demonstrates the case that the Project must be carried out for Imperative Reasons of Overriding Public Interest.

184. The environmental and social benefits to the UK from increasing the generation of low carbon energy are clear, with the Project forming a key part. The Project contributes to the UK's legally binding climate change targets by helping to decarbonise the UK's energy supply, whilst contributing to the essential tasks of ensuring security of supply and providing low cost energy for consumers in line with the UK Government's national policies.

185. The environmental benefits that the project provides are long term, with local benefits, reducing local air pollution and wider benefits such as helping to meet government renewable targets to tackle climate change.

186. If a conclusion of AEoI is reached by the Secretary of state, in respect of any of the relevant European sites then there is a demonstrable overriding public interest in the Project and the policy objectives it would serve, which outweigh the risk of any adverse impact on each site.

6 Compensatory Measures

187. Compensatory measures have been discussed with the Marine Management Organisation (MMO), Natural England and the RSPB and all parties have provided feedback on the potential options. This has resulted in some compensatory measures being screened out where these options were not considered to be feasible.

188. The remaining compensatory measures for each feature / site which will be investigated further can be found in the ***Offshore Ornithology Without Prejudice Compensatory Measures*** document submitted at Deadline 6 (document reference ExA.AS-8.D6.V1).

189. The ***Offshore Ornithology Without Prejudice Compensatory Measures*** document presents further detail on the methodology for each of the compensatory measures and the mechanisms for delivery of those measures .

7 Summary

190. The Applicant has provided information on all of the features listed in ***Table 1.1*** in the ***Information to Support Appropriate Assessment*** (ISAA) (APP-043). It is the Applicant's position in the ISAA that there would be no Adverse Effect on Integrity of any of the sites listed as a result of either project alone or in-combination effects. The Applicant has engaged with Interested Parties and has considered comments raised in their Relevant Representations and does not consider that any of the issues raised alter the position stated at the time of the application. This document therefore has been written to respond to the ExA's Procedural Decision 18 question with regard to the need to present the case for derogation of the Habitat Regulations for identified features and sites. This document presents that case on a **without prejudice basis** to allow for full consideration of all aspects of derogation during the examination.

191. This document sets out the Habitats Regulations Assessment process and provides a summary of the need for the Project. The document then proceeds through the derogation stages:

- Alternative solutions for the Project are assessed in an iterative manner. The Do Nothing, Alternative Forms of energy Generation and Alternative Location options have been examined and discounted. The project design envelope has been revised, and as a result there is no further feasible refinement available that would reduce effects upon the features and potential for Adverse Effect on Integrity of the Flamborough and Filey Coast SPA, Alde-Ore Estuary SPA and Outer Thames Estuary SPA.

- This report demonstrates the case that the Project must be carried out for Imperative Reasons of Overriding Public Interest. The environmental and social benefits to the UK from increasing the generation of low carbon energy are clear, with the Project forming a key part. The Project contributes to the UK's legally binding climate change targets by helping to decarbonise the UK's energy supply, whilst contributing to the essential tasks of ensuring security of supply and providing low cost energy for consumers in line with the UK Government's national policies.

- Having demonstrated that the Imperative Reasons of Overriding Public Interest tests are met, compensatory measures for each of the affected sites and features (***Table 1.1***) are provided.

192. If a conclusion of AEoI is reached by the Secretary of state, in respect of project impacts on any of the relevant European sites then there is a demonstrable

overriding public interest in the Project and the policy objectives it would serve, with deliverable compensatory measures available for each site.

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A.1 Appendix 1

A.1.1 Introduction

193. This Appendix has been included in the HRA Derogation Case to address questions raised by the Examining Authority (ExA) at 2.2.4, 2.2.5 and 2.2.7 of ***The Examining Authorities' written questions and requests for information (ExQs2)*** (PD-030) issued on 12 February 2021. The questions are set out in ***Table 8.1*** below:

Table 8.1. ExA questions (PD-030)

ExA. Question Ref.	ExA. Question	Where addressed
2.2.4	**The Applicant's Habitats Regulations Derogation Case [REP3-053]: alternative project designs** In Table 4.8 of [REP3-053] which sets out the assessment of alternative project designs, you state that in regard to increasing the distance to the OTE SPA you have considered the application of buffers of greater than 2 km. In updating your derogation case at Deadline 6, please provide further justification and evidence to explain the nature and spatial extent of the "existing and known future constraints" you refer to in Table 4.8 and explain how in practice such constraints would restrict the WTG siting options within the overall Project envelope for EA1N. Where the case builds on evidence in previously submitted documents (such as the ES or [REP3-073]) or oral submissions made at hearings, please set that evidence out in full for the derogation case and elaborate upon it. Please include a plan or plans illustrating all of the known and future constraints to support the case made, for example in relation to water depths and the location of exclusion areas for other consented cables and infrastructure	***Section A.1.2*** sets out the rationale for the commitment to a 2km buffer. ***Figure 1*** illustrates the known and future constraints within the windfarm site supporting the rationale for the 2km buffer commitment.
2.2.5	**The Applicant's Habitats Regulations Derogation Case [REP3-053]: illustrative array layout** In updating your derogation case at Deadline 6, please provide the following further justification and evidence: a) Please provide an indicative plan or plans, at an appropriate scale, to illustrate how 67 wind turbine generators (WTGs) plus supporting infrastructure could fit within the offshore order limits for EA1N whilst also taking into account the minimum spacing	a) ***Figure 1*** provides an indicative plan to illustrate how 67 WTGs plus supporting infrastructure (up to five offshore platforms and one meteorological mast) can fit within the offshore order limits for East Anglia ONE North whilst also taking into account the minimum spacing

ExA. Question Ref.	ExA. Question	Where addressed
	requirements between each WTG and the known and future constraints. b) Please explain (providing illustrative plans where possible) what alternative project designs in terms of turbine size, layout and location within the order limits have been considered in your assessment. c) Having regard to the comments received by NE at Deadline 5 about providing a 10 km buffer to the boundary of the OTE SPA [REP5-082], please explain why a buffer of greater than 2km (and up to 10km) is not achievable, providing evidence of both technical and commercial feasibility considerations. d) What degree of flexibility have you factored within your offshore order limits reduction to allow for as yet unknown constraints within the site that may only be identified following, for example, further site investigations? What is the justification for this approach?	requirements between each WTG and the known and future constraints. b) Part 'b)' has been addressed through a revision to ***Section 4.3*** earlier in this document. c) ***Section A.1.2*** sets out the rationale for the commitment to a 2km buffer on the OTE SPA. d) ***Section A.1.2.3*** address the degree of flexibility that the Applicant has factored into the reduced area of the offshore order limits to allow for unknown constraints.
2.2.7	**The Applicant's Habitats Regulations Derogation Case [REP3-053]: Increase in minimum turbine draught height** In Table 4.8 of [REP3-053] you state that: "*increasing air-draught beyond the commitment made to 24m above MHWS would have further implications on technical aspects (tower weight and foundation requirements) and commercial implications*." In [REP3-073] and at ISH1 you provide an indication of the windfarm sites' water depths and a general view of the layout constraints which could affect the feasibility of a further increased turbine draught height. Please provide evidence to fully justify the technical and commercial reasons why you are unable to commit to a minimum draught height of greater than 24m above MHWS for either project.	***Section A.1.3*** sets out the Applicants reasons why it cannot commit to an air-draught greater than 24m over MHWS.

A.1.2 Rationale for the 2km buffer commitment

194. This section provides the rationale for the commitment to a 2km buffer on the Outer Thames Estuary Special Protection Area (SPA). The information provided in this section is largely drawn from the ***Offshore Commitments*** (REP3-073)

document with additions specifically included to address the ExA questions set out in Table 9.1.

195. Natural England highlighted a significant concern in their relevant representation (RR-059) relating to the location of the East Anglia ONE North windfarm site relative to the boundary of the Outer Thames Estuary SPA. Natural England stated[18]:

"Natural England considers that the most critical issue concerning offshore ornithology is the impact of displacement on red-throated diver from the Outer Thames Estuary Special Protection Area (OTE SPA). Specifically, Natural England is concerned that the location of the EA1N array, which abuts the SPA boundary, will through displacement effects result in a long-lasting reduction in the availability of diver habitat in part of the SPA and a change of the distribution of divers within the SPA, and therefore conclude that there would be an adverse effect on site integrity, both alone and in-combination with other plans and projects. To address the risk of adverse impacts on the SPA, Natural England recommends that the proposed array is reconfigured such that no part of it is within 10km to the SPA boundary"

196. The Natural England advice for a 10km 'buffer' was not made formally to the Applicant pre-application.

197. In considering what buffer commitments could be made to reduce the potential for impact, the Applicant reviewed the constraints on relocation of the windfarm site and constraints within the windfarm site, and further detail on each of these is set out below.

A.1.2.1 Constraints on relocation of the East Anglia ONE North windfarm site

198. The East Anglia ONE North windfarm site boundary as defined by Works No 1, 2, 3 and 4 (see ***Works Plans (Offshore)*** (APP-010)) has been selected on the basis of the ZAP process (see ***chapter 4 Site Selection and Assessment of Alternative*** (APP-052) and further consideration of development potential carried out by the Applicant.

199. The boundary of the windfarm site is defined by the following constraints:

a. To the east: IMO shipping deep-water route (see ***Figure 14.1*** (APP-235) and ***chapter 14 Shipping and Navigation*** (App-042));

b. To the north: Cables and pipelines (see ***Figure 17.2*** (APP-248) and ***chapter 17 Infrastructure and Other Users*** (App-065));

[19] European Subsea Cables Association (2016) Guideline No.6 – The Proximity of Offshore Renewables Energy installations & Submarine Cable Infrastructure in UK Waters (website)

c. To the south: The constructed East Anglia ONE windfarm (see ***Figure 17.1*** (APP-247) and ***chapter 17 Infrastructure and Other Users*** (App-065)); and

d. To the west: The Outer Thames Estuary SPA.

200. The windfarm site boundary is drawn from consideration of these constraints, it is effectively a space within the combined constraints.

201. Additionally, the ornithological assessment for the Application, with respect to the potential displacement from wind turbines, has been carried out on the windfarm site.

202. Relocation of the windfarm site is therefore, not a viable option.

A.1.2.2 Constraints within the windfarm site

203. The East Anglia ONE North windfarm site occupies a relatively small area of 208km^2 when compared to other recent Southern North Sea windfarms such as Hornsea Project 3 (696km^2), Norfolk Vanguard (592km^2) and Norfolk Boreas (725km^2) as described in ***section 2.1*** *of the* ***Offshore Commitments*** (REP3-073) document. Within the windfarm site there are a number of constraints that will affect the layout of wind turbines, which are described below.

204. The windfarm site is relatively deep ranging between 35m to a maximum depth of 57m below LAT with 98% of the windfarm site between 40 and 57m below LAT (see ***Figure 1***). There is a relationship between water depth, foundation requirements and cost, where deeper water sites have implications for foundation type, for example in restricting the use of a monopile and carry a greater cost. Moreover, water depth sets a limit at which the technical requirements of types of foundations become commercially unviable at this location. This limit is approximately 50m below LAT for East Anglia ONE North, which is conservative in the absence of detailed site investigation data on the underlying geology and more likely to lie at approximately 48m below LAT.

205. The windfarm site also features areas of mobile seabed and sand waves, which are to be avoided where possible as they pose limits on foundation installation and affect the stability of cable burial and scour protection.

206. The separation distance between the southern boundary of the windfarm site and East Anglia ONE is 1km as shown in ***Figure 17.1*** (APP-247) and ***chapter 17 Infrastructure and Other Users*** (App-065). Search and rescue (SAR) lanes on East Anglia ONE run north south between the rows of wind turbines. Subject to the findings of the pre-construction site investigation, wind turbine layout design and proximity of wind turbines to the southern boundary of the windfarm site, it may be necessary to align wind turbines rows within the East Anglia ONE North

windfarm site with East Anglia ONE in order to meet the requirements of Marine Guidance Note (MGN) 543.

207. The Ulysses 2 cable and consented EA3 export cable cross the EA1N site (see ***Figure 1***). An exclusion zone of a minimum of 500m either side of each cable is required to follow best practice[19,20]. The area of seabed constrained by these cables is 36.6km^2, which represents approximately 17% of the windfarm area.

208. In addition to the known constraints on the wind turbine layout discussed above, it is likely that the pre-construction site investigation will identify the presence of further archaeological resources beyond the known resources documented in ***Chapter 16 – Marine Archaeology and Cultural Heritage*** (APP-064) and category 'A1' archaeological exclusion zones (AEZ) shown in ***Figure 1***. Depending on the nature of these resources and based on the experience gained at East Anglia ONE, it is likely that a number of them will require implementation of AEZ as set out in the ***Outline WSI (Offshore)*** (APP-583), which may further constrain the wind turbine layout.

209. Reefs formed by *Sabellaria spinulosa* are also likely to be identified through the site investigation and subsequent ground-truthing, to which the Applicant has made a commitment to avoid where practicable, secured through the ***Outline Sabellaria Reef Management Plan*** updated and submitted at Deadline 6 (ExA.AS-4.D6.V3). Due to the ephemeral nature of *Sabellaria* reefs and experience gained through the aforementioned East Anglia ONE project, it is anticipated that *Sabellaria* reefs may have developed since pre-application surveys were undertaken which would further constrain the wind turbine layout.

210. Finally, Unexploded Ordnance (UXO) may also constrain the wind turbine layout. However, due to the ability to clear UXO, as secured through the draft DCO, the influence of potential UXO on the wind turbine layout is lower.

A.1.2.3 2km buffer commitment

211. Given the constraints within the windfarm site discussed above, the Applicant has undertaken a number of analyses against potential wind turbine layouts to determine what impact adoption of buffers on the Outer Thames Estuary SPA would have on the Project between 0 – 10km. In undertaking these analyses, the known layout constraints were considered, but the unknown constraints, which were initially considered, were omitted on the basis that it would be difficult to make accurate predictions on the impact that *Sabellaria* reefs, archaeology and (to a lesser extent) UXO could have on the availability of space within the

[19] European Subsea Cables Association (2016) Guideline No.6 – The Proximity of Offshore Renewables Energy installations & Submarine Cable Infrastructure in UK Waters (website)
[20] Red Penguin Associates Ltd (2012) Submarine Cables and Offshore Energy Installations – Proximity Study Report. The Crown Estate (website)

windfarm site. The analyses therefore focused on the impact of the following parameters on target capacity and commercial viability:

a. Water depth;

b. Known areas of mobile seabed and sand waves;

c. Cables;

d. MGN543 requirements; and

e. Buffers on the Outer Thames estuary SPA between 0 – 10km

212. The results of the analyses have determined that a whilst a 2km buffer is likely to have a commercial impact on the project and would reduce spatial flexibility, the impact is considered tolerable. A commitment to a buffer of greater than 2km however, would reduce the remaining spatial flexibility and jeopardise the Project's ability to meet the target capacity in addition to impacts on commercial viability, principally through loss of viable wind turbine locations.

213. Maintaining spatial flexibility is particularly important to mitigate the potential impacts of unknown constraints, such as archaeology and *Sabellaria* reefs in addition to any unsuitable areas identified through the pre-construction site investigation. The ***Offshore Commitments*** (REP3-073) document made the point that the pre-construction capacity density (target capacity at the onshore connection point divided by the area of the windfarm site) is much higher for the Project in comparison to other recent Southern North Sea projects as shown in ***Table 8.2*** below. A project with a higher capacity density has lower resilience (spatial flexibility) to mitigate known and unknown layout constraints.

Table 8.2. A comparison of capacity density of East Anglia ONE North and East Anglia TWO with other Southern North Sea windfarms

Project	Windfarm area (km^2)	Capacity target (MW)	Capacity density (MW/km^2)
Norfolk Boreas[21]	725	1800	2.4
Norfolk Vanguard[22]	592	1800	3.0

[21] Norfolk Boreas Limited (2019). Norfolk Boreas Offshore Wind Farm, Chapter 5, Project Description. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010087/EN010087-000391-6.1.5%20Environmental%20Statement%20Chapter%205%20Project%20Description.pdf

[22] Norfolk Vanguard Limited (2018). Norfolk Vanguard Offshore Wind Farm, Chapter 5, Project Description. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-001493-Chapter%2005%20Project%20Description%20Norfolk%20Vanguard%20ES.pdf

Project	Windfarm area (km^2)	Capacity target (MW)	Capacity density (MW/km^2)
Hornsea Project 3[23]	696	2400	3.4
East Anglia ONE North	203	800	3.9
East Anglia TWO	213	900	4.2

A.1.2.4 Indicative windfarm layout

214. ***Figure 1*** provides an indicative plan to illustrate how 67 WTGs plus supporting infrastructure (up to five offshore platforms and one meteorological mast) can fit within the offshore order limits for East Anglia ONE North whilst also taking into account the minimum spacing requirements between each WTG (1200m between rows of WTG by 800m between WTG in a row) and the known and future constraints.

A.1.3 Wind turbine air-draught

215. This section explains the reasons why the Applicant cannot commit to increasing air-draught beyond the commitment made to an air-draught of 24m over MHWS. The information provided in this section is largely drawn from the ***Offshore Commitments*** (REP3-073) document with additions specifically included to address the ExA questions set out in Table 9.1.

216. The Applicants have assessed the technical and commercial implications of increasing the draught above 22m MHWS. The following has been concluded:

- Draught between 22m MHWS to 30m MHWS are deemed technically feasible with increasing commercial impact on the project.
- Draught over 30m MHWS is considered technically unfeasible with current Installation Vessels and WTG technology considered.

217. It has been concluded that draughts greater than 24m over MHWS will add significant cost and restrict flexibility in foundation options. The following factors have been assessed to reach the above conclusion:

- Annual energy production: larger draughts results in higher hub height, reaching higher wind speed and an increase in production. This is deemed marginal.
- Foundation feasibility and cost: the large water depth of the East Anglia ONE North site challenges the limits of extra-large monopile feasibility. Draught and consequently, hub height are design driver for these structures. ScottishPower has worked with specialist foundation designers to understand

[23] Orsted (2018). Hornsea Project THREE Offshore Wind Farm, Chapter 3, Project Description. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-000528-HOW03_6.1.3_Volume%201%20-%20Ch%203%20-%20Project%20Description.pdf

the limits of feasibility of the concept. Given the stage of the project and uncertainties in geotechnical characteristics of the site and WTG technology, it has been concluded that draughts greater than 24m MHWS add significant risk to the technical feasibility of the concept for the site. As stated in the ***offshore commitments*** (REP3-073) document, 98% of East Anglia ONE North lies in water depths of 40 – 57m below LAT. Moreover, water depth sets a limit at which the technical requirements of types of foundations become commercially unviable at this location. This limit is approximately 50m below LAT which is conservative in the absence of detailed site investigation data on the underlying geology and more likely to lie at approximately 48m below LAT. Simply put, at the cut off 48m below LAT, an air-draught of 24m already sets the foundation at 72m in length. As a result, greater draughts would require water depths to be limited with the consequent loss of buildable area. Alternative, different foundation types would be required adding significant complexity, cost and reduced supply chain flexibility to the projects.

- Transport and Installation: there is limited number of turbine installation vessels in the current fleet that could reach up to 30m above MHWS draught and consequent hub height.

450000 455000 460000 465000 470000 475000

5810000 5805000 5800000 5795000

N

Nautical Miles
0 1 2

Kilometres
0 3

- Locations (67 x WTG, 5 x Platform, 1 x Met Mast) (73)
- Third Party Cables (Active)
- EA3 Preliminary Export Cable
- EA3 Alternate Export Cable
- Cable Exclusion Zone (750 m)
- Archaeology 100 m Buffer
- EA1N Buildable Area (-125 m buffer)
- EA1N DCO Boundary

Bathymetry (Gardline, 2017) [m]

- 0-50
- 50-55
- >55

Rev	Date	By	Comment			
4	22/02/2021	JB	Final	Prepared:	JB	1:80,000 Scale @ A3
2	12/12/2018	DB	Layout Revised	Prepared:	DB	
1	04/12/2018	DB	First Issue	Checked:	CL	
				Approved:	JR	

East Anglia ONE North

Indicative layout for 67 wind turbines and associated infrastructure (2060 m x 1000 m)

Drg No	EA1N-GEN-DG-IBR-000223
Rev	4
Date	22/02/2021
Figure	1

Datum: WGS 1984
Projection: UTM Zone 31N

E:\EAOW\East Anglia 1N\04_Drawing_Figures\OFFSHORE\OWF_ENGINEERING\Turbines\IntermediateLayoutsConstraints\EA1N-GEN-DG-IBR-000223 REV 4 WTG Layout with 12MW D220m 5x10xD with Constraints_(2060 x 1000m).mxd