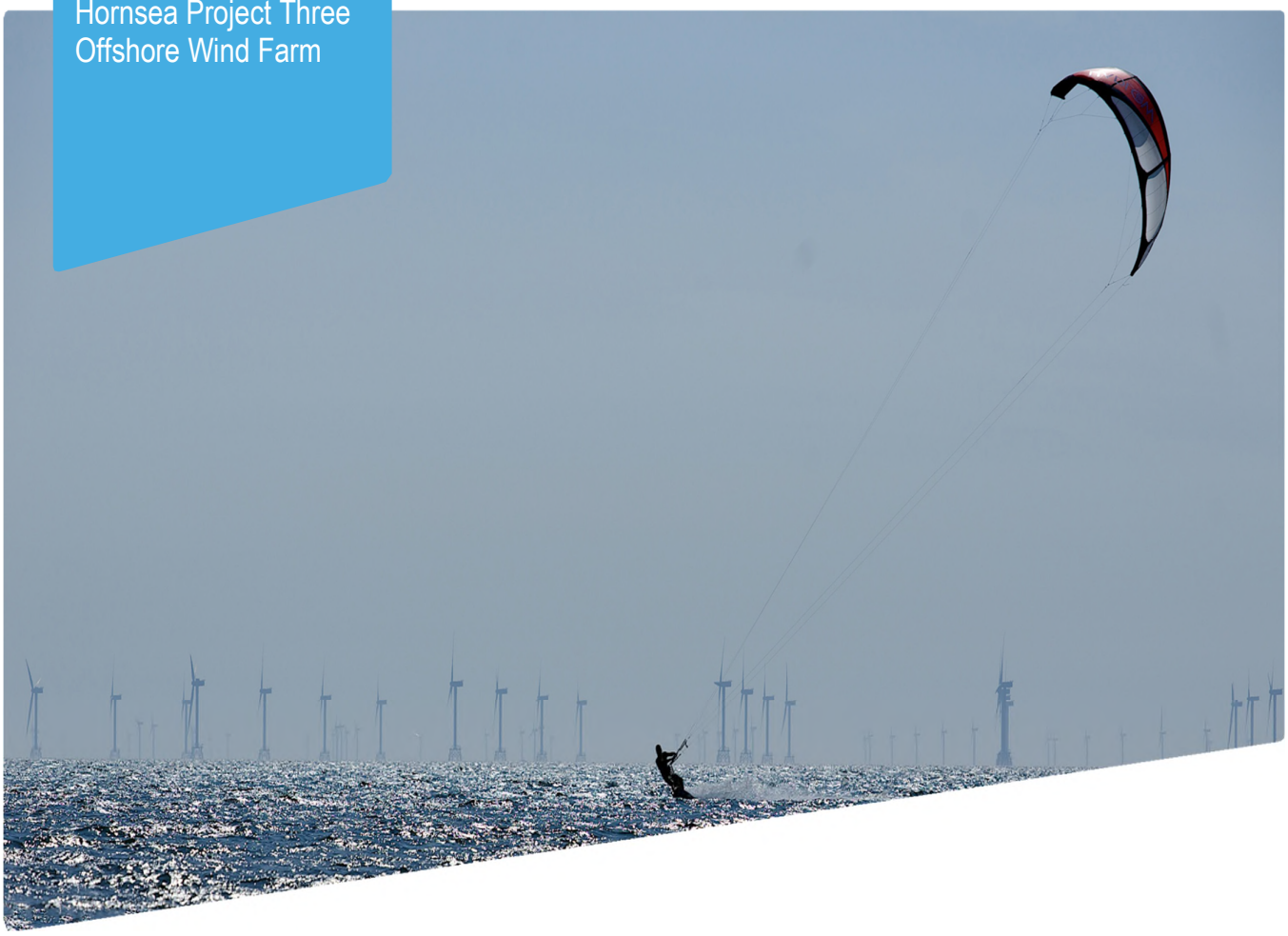
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Applicant's Response to Secretary of State's Consultation
Appendix 1: Shadow HRA Derogation Case

Date: February 2020

Hornsea 3
Offshore Wind Farm

Ørsted

Applicant's Response to Secretary of State's Consultation

Shadow HRA Derogation Case

Applicant's response to the Secretary of State's consultation request seeking submissions and evidence in respect of the HRA derogation requirements as they may be applied in the context of Hornsea Three with regard to certain identified European sites and qualifying features.

Document Control			
Document Properties			
Organisation	Ørsted Hornsea Project Three		
Lead Author	Part 1: Introduction: Ørsted and Pinsent Masons Part 2: Alternative Solutions: Ørsted, Pinsent Masons and RPS Part 3: IROPI: Ørsted and Pinsent Masons		
Checked by	Andrew Guyton		
Approved by	Matthew Wright		
Title	Appendix 1: Shadow HRA Derogation Case		
Version History			
Date	Version	Status	Description / Changes
14/02/2020	A	Final	Submission

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Front cover picture: Kite surfer near a UK offshore wind farm © Orsted Hornsea Project Three (UK) Ltd., 2018.

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Acronyms

Acronym	Description
AA	Appropriate Assessment
AC	Alternating current
AEOI	Adverse effect on integrity
AMEP	Able Marine Energy Park
BEIS	Department for Business, Energy and Industry Strategy
BICP	Benthic Impacts Control Plan
CCC	UK's Committee on Climate Change
CfD	Contracts for Difference
CSIP	Cable Specification and Installation Plan
CO2	Carbon dioxide
DC	Direct current
DCO	Development Consent Order
DECC	Department of Energy & Climate Change
DEFRA	Department for Environment, Food & Rural Affairs
DML	Deemed Marine Licence
ES	Environmental Statement
EEZ	Exclusive Economic Zone
EU	European Union
ExA	Examining Authority
FFC	Flamborough and Filey Coast
FCS	Favourable Conservation Status

Acronym	Description
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IPCC	Intergovernmental Panel on Climate Change
IROPI	Imperative reasons of overriding public interest
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effects
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MMO	Marine Management Organisation
NNSSR	North Norfolk Sandbanks and Saturn Reef
NPS	National Policy Statement
OESEA	Offshore Energy SEA
OFTO	Offshore Transmission Owner
PINS	Planning Inspectorate
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Area
TCE	The Crown Estate
UK	United Kingdom
WNNC	The Wash and North Norfolk Coast
ZAP	Zone Appraisal and Planning
ZDA	Zone Development Agreement

Shadow HRA Derogation Case

Part 1: Background, Context & Approach

1. Introduction

The Project

1.1 Orsted Hornsea Project Three (UK) Limited (the **Applicant**) applied on 14 May 2018 for an order granting development consent under the Planning Act 2008 (PINS reference EN010080) (the **Application**) for the Hornsea Three offshore wind farm, within the former Hornsea Zone, in the southern North Sea (**Hornsea Three**).

1.2 With a potential capacity of at least 2.4GW, Hornsea Three could be the world's largest offshore wind farm, providing green electricity to well over 2 million UK homes per year[1] before 2030.

Process to Date

1.3 The Application was accepted by the Planning Inspectorate (**PINS**) on behalf of the Secretary of State for the Department of Business, Energy and Industrial Strategy (the **Secretary of State**) on 8 June 2018. It was examined by the appointed Examining Authority (**ExA**) between 2 October 2018 and 2 April 2019 (**Examination**).

1.4 The findings and recommendation of the ExA were submitted to the Secretary of State on 2 July 2019 and will be published in due course alongside the final decision on the Application by the Secretary of State.

Consultation on the HRA Derogation Provisions

1.5 On 27 September 2019 the Secretary of State issued a consultation (the **Consultation**) seeking submissions and evidence from the Applicant on, amongst other matters, the requirements of Regulations 64 and 68 of the Conservation of Habitats and Species Regulations 2017 and Regulations 29 and 36 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. We refer to these as the **HRA Derogation Provisions**.

1.6 The HRA Derogation Provisions encompass the last two stages of a wider (four stage) process known as Habitats Regulations Assessment (**HRA**). If the requirements are met, Hornsea Three can still be authorised even if the Secretary of State is not satisfied that there would be no adverse effect on integrity (**AEOI**) in respect of the relevant European site(s)[2].

1.7 This part of the Applicant's Response to the Consultation, alongside the report on compensatory measures (Appendix 2 to Applicant's Response), contains the Applicant's evidence on the HRA Derogation Provisions. It demonstrates that the HRA Derogation Provisions can be satisfied if it is necessary to resort to them to authorise Hornsea Three.

[1] This is based on an approximate capacity of 2.4GW and a conservative load factor using the 5-year average for offshore wind of 38.74% (BEIS, July 2019).
[2] Post-Brexit the Habitats Regulations continue to use the term "European site" to refer to SPAs and SACs.

2. The Precautionary Basis of this Submission

2.1 The Secretary of State has confirmed that the Consultation is without prejudice to any final decision on the Application and does not imply any conclusions have or that may be reached. The Consultation on the HRA Derogation Provisions is understood by the Applicant to be provisional and exploratory.

2.2 This submission is similarly provisional and exploratory. The Applicant does not accept that the application of the HRA Derogation Provisions is necessary but has provided the information necessary to support a clear and overriding HRA derogation case for Hornsea Three, which could be relied upon by the Secretary of State if required.

The Applicant's Primary Position

2.3 The Applicant's response is provided without prejudice to the Applicant's firm position that it can be concluded beyond reasonable scientific doubt that Hornsea Three would not give rise to any AEOI, alone or in combination with other projects or plans.

2.4 Comprehensive evidence to support the Applicant's conclusion is set out within the Applicant's Report to Inform an Appropriate Assessment and its accompanying appendices (**APP-051 to APP-054, AS-002 and AS-004**) (the "**RIAA**"). The Applicant stands by the assessment presented in and conclusions of the RIAA.

Reduced MDS and Increased Confidence

2.5 The conclusions in the RIAA relate to a maximum design scenario ("**MDS**") for Hornsea Three with a greater footprint and impact on European sites than the design now before the Secretary of State. Post-Examination, the Applicant has continued to optimise the envelope for Hornsea Three and has committed to further, significant reductions in the MDS for Hornsea Three. These are summarised in **Part 1 Section 7** below.

2.6 When these additional commitments are added to the existing body of evidence, the Applicant believes a conclusion of no AEOI for all European sites can confidently be reached.

3. Scope and Focus of this Submission

3.1 By letter dated 31 October 2019 the Secretary of State confirmed the scope of the Consultation on the HRA Derogation Provisions should be focussed on the following European sites, features and impacts only.

Table 3.1: Relevant European sites and features

European Sites	Relevant Qualifying Feature	Relevant Impact from Hornsea Three
North Norfolk Sandbanks and Saturn Reef Special Area of Conservation ("**NNSSR SAC**")	"sandbanks slightly covered by water at all times"	Placement of cable protection on seabed
The Wash and North Norfolk Coast Special Area of Conservation ("**WNNC SAC**")	"sandbanks slightly covered by water at all times"	Placement of cable protection on seabed

European Sites	Relevant Qualifying Feature	Relevant Impact from Hornsea Three
Flamborough and Filey Coast Special Protection Area ("**FFC SPA**")	breeding kittiwake feature	Collision risk

3.2 It should be noted that the Applicant considers the deployment of cable protection to be a long-term temporary impact as decommissioning of cable protection is committed to in the draft DCO, but should the Secretary of State conclude that cable protection results in a permanent impact it is the Applicant's position that this HRA Derogation Case is equally robust and applicable to that permanent impact.

4. Content and Structure

Content

4.1 This submission comprises three main parts, structured as follows:

4.1.1 **PART 1**: sets out:

i. an overview of the legal context and HRA process (**section 5 below**),

ii. identifies the relevant European site features and condition (**section 6 below**),

iii. the relevant aspects of the MDS for Hornsea Three and residual impact on the relevant features of the European site(s) (**section 7 below**), and

iv. some important contextual considerations (**sections 8 and 9 below**)

4.1.2 **PART 2**: comprises a **Report to Demonstrate No Alternatives Solutions**. This examines whether there are any feasible alternative solutions to Hornsea Three that meet its core project objectives and concludes that there are none.

4.1.3 **PART 3**: comprises a **Report to Demonstrate IROPI**. This identifies the IROPI which would justify a decision by the Secretary of State to authorise to Hornsea Three notwithstanding any AEOI conclusion.

4.2 In addition, a standalone **Report on Compensatory Measures** (Appendix 2 to Applicant's Response) is provided, which sets out a range of feasible compensation measures considered sufficient to ensure the coherence of the national site network.

Engagement by the Applicant

4.3 The Report on Compensatory Measures has been informed by constructive engagement with Natural England, the Marine Management Organisation (**MMO**), the Royal Society for the Protection of Birds (**RSPB**), and the Eastern Inshore Fisheries and Conservation Authority (**EIFCA**).

4.4 The Applicant has kept other parties with an interest in the scope of compensation measures, such as The Wildlife Trusts and the Environment Agency, informed during the consultation period. Detail of consultation activity undertaken by the Applicant is set out in Appendix 8 to Applicant's Response.

Supporting Information

4.5 This submission refers to material submitted as part of the Application or during Examination and which, for brevity, is not reproduced here.

4.6 Where reference is made to material submitted during the Examination, the referencing used in the final Examination library published by PINS dated 8 May 2019 has been adopted and the information can be viewed within the Examination library, which remains publicly available[3].

4.7 Where new documentation or material is referenced and relied upon here for the first time, that is listed in the covering letter to the Applicant's Response to Secretary of State and copies are enclosed.

Status of this Submission

4.8 The Applicant has made every effort to ensure consistency between documents and provide a clear audit trail which highlights if, where and to what extent more recent submissions modify or supersede earlier submissions. However, in the event of any inconsistency with previous submissions, it should be assumed that this submission records the Applicant's final position on the relevant topic or matter.

4.9 This submission supersedes the Applicant's preliminary response made at Examination Deadline 4 on the Derogation Provisions in respect of NNSSR SAC, WNNC SAC and FFC SPA, in response to ExA second written questions 2.2.7 and 2.2.44 (see REP4-082).

5. The Legal Framework and HRA Process

Background: The Habitats Directive

Aim of the Habitats Directive

5.1 The Habitat Regulations transposed into UK law the requirements of the Habitats Directive[4]. Although the UK left the EU on 31 January 2020, the Habitats Directive provides the legislative backdrop to the Habitats Regulations.

5.2 The Habitats Directive seeks to conserve particular natural habitats and wild species across the European Union (**EU**) by, amongst other measures, establishing a network of sites ("**European sites**") which together form the "*Natura 2000 network*". The aim is to ensure the long-term survival of viable populations of Europe's most valuable and threatened species and habitats, to maintain and promote biodiversity.

5.3 The network of European sites[5] consists of Special Protection Areas ("**SPA**") classified pursuant to the Birds Directive[6] and Special Areas of Conservation ("**SAC**") designated pursuant to the Habitats Directive.

[3] Planning Inspectorate 2019. Hornsea Project Three Offshore Wind Farm Examination Library – Updated 08 May 2019. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-000748-06%20-%20Hornsea%203%20Examination%20Library%20Published%20Version.pdf
[4] EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

Articles 6(3) & 6(4): Authorisation of Plans and Projects

5.4 Requirements concerning the authorisation of plans or projects which may adversely affect European sites are contained in articles 6(3) and 6(4), set out in full in Table 5.1 below[7].

Table 5.1: Legal text of articles 6(3) and 6(4)

Article 6(3)
"*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4 (i.e. Art. 6(4)), the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.*"
Article 6(4)
"*If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.* *Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.*"

The HRA Process

5.5 The process encompassing the requirements of articles 6(3) and 6(4) is commonly referred to as HRA. PINS Advice Note Ten[8] ("**AN10**") describes HRA as "*multi-staged*" and indicates that it consists of four[9] principal stages, reproduced in column B of Table 5.2 below (see Figure 1 in AN10).

Table 5.2: HRA Process relative to legal text of articles 6(3) and 6(4), Habitats Directive

Habitats Directive Provision	HRA stages (per PINS AN10)
Article 6(3)	Stage 1 - Screening for Likely Significant Effects (**LSE**)
	Stage 2 – Appropriate Assessment (**AA**)
Article 6(4)	Stage 3 – Assessment of Alternatives
	Stage 4 – Consideration of IROPI and compensatory measures

[5] Though not relevant in this case, in the UK the protection afforded to European sites is applied to Sites of Community Importance, and (as a matter of policy) to candidate SACs, possible SACs, potential SPAs and Ramsar sites
[6] EC Directive 2009/147 (consolidated version).
[7] The provisions of the Birds Directive need not be set out because articles 6(3) and (4) apply equally to SPAs.
[8] Version 8, republished November 2017.
[9] See Figure 1 in AN10. It is assumed in AN10 that the project in question is not directly connected with or necessary to the management of the European site in question. That is true of Hornsea Three.

5.6 HRA is generally described as a sequential process, as article 6(4) is consequent upon and follows from a negative outcome to article 6(3). In practice, there can be a degree of overlap between stages and PINS AN10 recognises that the process can be "iterative".

The UK Habitats Regulations

5.7 The applicable requirements of the Habitats Directive are transposed into UK legislation through the Conservation of Habitats and Species Regulations 2017[10] and the Conservation of Offshore Marine Habitats and Species Regulations 2017[11] (together, as amended, the **Habitats Regulations**).

5.8 The relevant provisions in the two sets of Habitats Regulations are materially the same and there is no legal or practical need to differentiate between them in this submission.

5.9 The *Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019* (**EU Exit Regulations**) ensure continued application of the Habitats Regulations post-Brexit. The implications of Brexit are addressed at paragraph 5.24 below.

HRA stages 1 and 2[12]

5.10 The need for and application of the HRA Derogation Provisions flows from the outputs of HRA Stages 1 and 2. The requirements of Stages 3 and 4 are applied based upon the nature and the extent of any AEOI identified through Stages 1 and 2. It is therefore appropriate to first address Stages 1 and 2 and the key legal principles that apply, as established by the courts.

5.11 HRA Stages 1 and 2 require that any project[13] likely to have a significant effect on a European site (alone or in combination) must be subject to an AA of the implications for that European site in view of the site's conservation objectives. Subject to the HRA Derogation Provisions (Stages 3 and 4), the project must not be authorised if it is concluded, based on the AA, that there would be any AEOI of any European site(s).

5.12 Detailed submissions are made in the *Applicant's Legal Closing Submission* (**REP10-038**) on the required approach to HRA Stages 1 and 2, drawing on European and UK case law. Those cases establish the parameters of the exercise and evidential requirements at HRA Stages 1 and 2.

5.13 In summary, the following important principles apply:

5.13.1 Article 6(3) provides for evidence-based decision-making that takes account of scientific assessment but is an evaluation of the acceptable level of risk that remains after this assessment. The consideration of risk is within the discretion of the competent authority.

5.13.2 The assessment must be supported by expert evidence, but such evidence includes the exercise of judgment and grappling with uncertainties and predictive methods.

[10] Applies onshore and 0-12 nautical miles.
[11] Applies offshore from 12 – 200nm.
[12] Regulation 63 of Conservation of Habitats and Species Regulations 2017 and regulation 28 of Conservation of Offshore Marine Habitats and Species Regulations 2017.
[13] The Habitats Regulations apply to plans as well as projects but this submission is concerned specifically with a project.

5.13.3 Conversely, contended risks must be real, not hypothetical to give rise to reasonable scientific doubt. One may reasonably expect evidence to be provided to support any contended risk.

5.13.4 The requirement for "certainty" means satisfied beyond reasonable scientific doubt. It does not require absolute certainty.

5.13.5 In the context of projects in the marine environment there will always be degrees of scientific uncertainty. Accepting absolute certainty is impossible, it is permissible to work with probabilities and estimates, so long as they are identified, reasoned and precautionary.

5.13.6 The level of acceptable risk is when the competent authority is satisfied from an assessment of the best available evidence that the remaining risks do not undermine its certainty that the integrity of the site concerned will not be adversely affected.

5.13.7 AA requires evaluative judgements having regard to many factors and considerations. In the real world, the best available evidence is imperfect, rarely definitive and can always be improved. It is necessary and lawful to rely on prediction, taking a precautionary approach where evidence is more limited.

5.13.8 As the conclusion of an AA necessarily involves subjective judgements, a competent authority may, from its point of view, be certain even though from an objective point of view there is no absolute certainty.

Applicant's Stages 1 & 2 Conclusions

5.14 The RIAA (APP-051-054) submitted by the Applicant, as supplemented by REP1-187 (screening & integrity matrices), sets out the methodology and evidence of the Applicant in respect of HRA Stages 1 and 2, applying the above legal principles.

5.15 In respect of the MDS at Application-stage, the RIAA concluded that LSE (Stage 1) as a result of Hornsea Three could not be discounted in respect of qualifying features of each of NNSSR SAC, WNNC SAC and FFC SPA and a shadow AA (Stage 2) was undertaken.

5.16 Having regard to the mitigation secured by requirements and conditions of the DCO/DML, the Applicant's RIAA concluded that Hornsea Three would not lead to any AEOI in respect of any of NNSSR SAC, WNNC SAC and FFC SPA[14].

HRA Stages 3&4

5.17 The HRA Derogation Provisions allow a project found to give rise to an AEOI to be authorised, provided the competent authority is satisfied:

5.17.1 there are no feasible "*alternative solutions*" to the project; and

[14] APP-051, Sections 5.5 and 5.8 for WNNC SAC; Sections 5.6 and 5.9 for NNSSR SAC and Sections 7.5 and 7.7 for FFC SPA; REP3-024 for WNNC SAC, REP1-005 and REP1-139 for the FFC SPA.

5.17.2 the project must proceed for "*imperative reasons of overriding public interest*" (**IROPI**).

5.18 The relevant statutory requirements are as follows[15]:

Table 5.3: Regulations relating to Alternative Solutions and IROPI (as amended post-Brexit)

Regulation	Title: Considerations of overriding public interest[16]
64(1)	*If the competent authority is satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (2), may be of a social or economic nature), it may agree to the plan or project notwithstanding a negative assessment of the implications for the European site or the European offshore marine site (as the case may be).*
64(2)	*(2) Where the site concerned hosts a priority natural habitat type or a priority species, the reasons referred to in paragraph (1) must be either-* *(a) reasons relating to human health, public safety or beneficial consequences of primary importance to the environment; or* *(b) any other reasons which the competent authority, having due regard to the opinion of the appropriate authority, considers to be imperative reasons of overriding public interest.*

5.19 Given the conclusion of the RIAA, the Applicant has not previously provided detailed evidence in respect of HRA Stages 3 and 4. Preliminary submissions were made at Examination Deadline 4 by the Applicant in respect of NNSSR SAC, WNNC SAC and FFC SPA, in response to ExA second written questions 2.2.7 and 2.2.44 (see REP4-082). That response is superseded by this submission.

5.20 The approach taken by the Applicant with regard to "alternative solutions" is set out in detail in Part 2: Report to Demonstrate No Alternatives. Similarly, the Applicant's approach to IROPI is set out in Part 3: Report to Demonstrate IROPI.

5.21 If satisfied there are no feasible alternative solutions and Hornsea Three must proceed for IROPI, the Secretary of State will be under an obligation to secure that any necessary compensatory measures can be undertaken. The relevant statutory requirements in respect of compensation are as follows:

[15] The statutory text is taken from The Conservation of Habitats and Species Regulations 2017. Reg 29 of the offshore Habitats Regulations is in materially the same terms.
[16] Sub-paragraphs (3) – (6) are not applicable here as they apply where a person other than the Secretary of State is the CA and the project in question affects a priority habitat or species.

Table 5.4: Legal text of regulations relating to compensatory measures (as amended post-Brexit)

Regulation	Title: Compensatory measures
68	*Where in accordance with regulation 64—* *(a) a plan or project is agreed to, notwithstanding a negative assessment of the implications for a European site or a European offshore marine site, or* *(b) a decision, or a consent, permission or other authorisation, is affirmed on review, notwithstanding such an assessment,* *the appropriate authority must secure that any necessary compensatory measures are taken to ensure that the overall coherence of the national site network is protected.*

5.22 The Habitats Regulations do not define what is meant by or may comprise "*compensatory measures*" or when they must be delivered. There is also no definition of the "*overall coherence of the national site network*". In principle, both are broad concepts. The limited case law on compensation confirms only:

5.22.1 Compensation is distinct from mitigation (i.e. measures which prevent, avoid or reduce the harm to the integrity of the affected European site)[17].

5.22.2 Compensation can be delivered inside or outside a European site[18].

5.23 As there is no binding EU or UK case law that fixes the precise parameters of or timing for delivery of compensation, there is a degree of flexibility and it will be a matter of judgement for the Secretary of State to determine what is "*necessary*" by way of compensation, acting reasonably and proportionately. The Secretary of State may have regard to EC opinions and guidance but is not bound to follow them.

Implications of Brexit

5.24 The UK exited the EU on 31 January 2020. As noted above, the EU Exit Regulations ensure the continued application of the Habitats Regulations and HRA process post-Brexit. The broad intention of the EU Exit Regulations is to ensure continuity after "exit day".

5.25 While the basic legal framework for HRA is maintained, there are technical changes to ensure continued operability. For example, functions previously undertaken by the EC in designating future SACs and providing opinions on IROPI have been transferred to UK Ministers.

[17] Case C-521/12 *Briels and Others*, paragraphs 38 – 39
[18] Case C-521/12 *Briels and Others*, paragraphs 38 – 39.

5.26 The "business as usual" position is subject to the important caveat that, although the Habitats Regulations continue to use the term European sites, those sites now form part of a "*national site network*"[19]. References in the Habitats Regulations to the coherence of "*Natura 2000*" must now be read and construed as references to the coherence of the "*national site network*".

5.27 Subject to that caveat, Brexit is not of material consequence to how the HRA process is applied to Hornsea Three.

Guidance Documents

Key Sources

5.28 The following UK and EC guidance addresses the Derogation Provisions and is referred to in this submission, where applicable and appropriate:

- Habitats Directive: guidance on the application of article 6(4), December2012 ("**DEFRA 2012**")[20];
- Managing Natura 2000 Sites - The provisions of Article 6(3) of the 'Habitats' Directive 92/43/EEC (2000) ("**MN 2000**"), first published in 2000 and updated in November 2018[21];
- EC Methodological Guidance for the Habitats Directive: Assessment of plans and projects significantly affecting Natura 2000 sites, methodological guidance on the provisions of articles 6(3) and 6(4) of the Habitats Directive (2000)[22] ("**EC Methodological Guidance**").

Status and Weight of UK & EC Guidance

5.29 In its submission at Deadline 10 (REP10-056b), the RSPB note that DEFRA 2012 is a statement of the UK Government's policy interpretation of the law and that it cannot be considered to be legally definitive. That is accepted but is equally true of MN 2000 and the EC Methodological Guidance, which are non-binding interpretations expressed by one EU institution (the EC), not the ECJ. The foreword to MN 2000 makes this point (our emphasis added):

> "*The interpretations provided by the Commission cannot go beyond the Directive. This is particularly true for this directive as it* ***enshrines the subsidiarity principle and as such lets a large margin of manoeuvre to the Member States for the practical implementation of specific measures related to the various sites of the Natura 2000 network****. In any case, the Member States are free to choose the appropriate way they wish to implement the practical measures provided the latter achieve the results of the Directive*.
>
> *However interpretative, this document is* ***not intended to give absolute answers to site specific questions****. Such matters should be dealt with on a case-by-case basis, while bearing in mind the orientations provided in this document*."

[19] Regulations 4 and 33, EU Exit Regulations.
[20] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/82647/habitats-directive-iropi-draft-guidance-20120807.pdf
[21] Available at: http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_._nov_2018_endocx.pdf
[22] Available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf

5.30 It is not part of the Applicant's case that there is any fundamental disagreement between DEFRA 2012 and the MN 2000. However, if and to the extent RSPB contend otherwise, the Applicant submits that there is no legal or policy reason why guidance in MN 2000 must or should be preferred by the Secretary of State over DEFRA 2012. That is particularly so following Brexit.

6. Relevant Features and Condition of the European Sites

6.1 As directed by the Secretary of State, the Applicant's Response to the Consultation is focussed on the following European sites and features only:

Table 6.1: Relevant European sites and features

European Site	Relevant Qualifying Feature
NNSSR SAC	"*sandbanks slightly covered by water at all times*"
WNNC SAC	"*sandbanks slightly covered by water at all times*"
FFC SPA	breeding kittiwake feature

6.2 The following sections summarise these sites and features, drawing on previous evidence and submissions submitted with the Application or during Examination. For further detail below see:

- RIAA (**APP-051**);
- The Wash and North Norfolk Coast SAC In-combination Assessment (REP3-024);
- Applicant's Comments on Condition Assessment for The Wash and North Norfolk Coast SAC (REP6-019);
- Position Statements for Natural England and the Applicant on matters relating to Benthic Ecology and Marine Processes (REP9-016); and
- Benthic Impact Control Plan (REP10-027).

North Norfolk Sandbanks and Saturn Reef SAC (NNSSR SAC)

Introduction

6.3 The NNSSR SAC was designated in 2017 and covers 360,341 ha in UK offshore waters. The site is designated as it hosts two habitats listed in Annex I. Only one is relevant to the Consultation: *Sandbanks which are slightly covered by sea water all the time*.

6.4 The North Norfolk Sandbanks are the most extensive example of the offshore linear ridge sandbank type in UK waters and include the Leman, Ower, Inner, Well, Broken and Swarte banks and four banks collectively called the Indefatigables.

Conservation Objectives and Condition

6.5 The conservation objectives are for the sandbank feature to be in favourable condition, thus ensuring site integrity in the long term and contribution to Favourable Conservation Status ("**FCS**"). This contribution would be achieved by maintaining or restoring, subject to natural change:

- The extent and distribution of the qualifying habitat in the site;
- The structure and function of the qualifying habitat in the site; and
- The supporting processes on which the qualifying habitat relies.

6.6 The Joint Nature Conservation Committee (**JNCC**) advises that the Annex I Sandbanks need to be restored to favourable condition. In respect of the three attributes identified above, JNCC advice (2017), based on judgement is as follows:

Table 6.2: NNSSR – JNCC advice on site condition

Attribute	Objective
Extent and distribution	Restore
Structure and function	Restore
Supporting processes	Maintain

6.7 The Applicant noted during the examination[23] that the above condition assessment for the NNSSR SAC is highly precautionary and based on judgement rather than survey data, specifically, JNCC's understanding of the feature's sensitivity to pressures, which can be exerted by ongoing activities i.e. demersal fishing, oil and gas sector activities and cabling.

6.8 The conservation objectives acknowledge that confidence in the condition assessments would be improved by access to better information on activities within the sites and better monitoring data. During Examination, the Applicant proposed a package of monitoring commitments aligned with the conservation objectives of the SACs and studies to address uncertainties in the site condition assessment (REP10-027). With respect to the Annex I sandbanks feature, this includes a study on the implications of existing infrastructure on Annex I features within the NNSSR SAC.

6.9 For the avoidance of doubt, the proposals in REP10-027 have no bearing on the Applicant's conclusion that the MDS for Hornsea Three would not give rise to an AEOI of the NNSSR SAC. The Applicant's assessments take into consideration the current condition of the NNSSR SAC.

The Wash and North Norfolk Coast SAC (WNNC SAC)

Introduction

6.10 The WNNC SAC was designated in April 2015 and encompasses an area of 107,761 ha in UK waters. The site hosts seven qualifying habitats listed in Annex I.

6.11 Of the seven qualifying Annex I habitats, only one is relevant to the Consultation: *Sandbanks which are slightly covered by sea water all the time*.

[23] *Applicant and Natural England Position Statement on the NNSSR SAC* (REP9-016)

6.12 The WNNC SAC has one of the largest expanses of subtidal sandbanks within the UK and is characteristic of the wider seascape of the sheltered east coast (JNCC, 2013). The site's subtidal sandbanks are comprised of a mosaic of sandy sediment types including coarse, mixed and muddy sand communities (JNCC, 2014; APEM, 2013), with three sub-features identified as coinciding with the Hornsea Three DCO boundary (and therefore relevant to this Consultation): (i) Subtidal Coarse Sediments, (ii) Subtidal Mixed Sediments and (iii) Subtidal Sand[24]. The extents of these, based on the latest site specific survey data available, are presented in Annex D of Appendix 4 of Applicant's Response.

Conservation Objectives and Condition

6.13 The conservation objectives which apply to the WNNC SAC as a whole and the individual features are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the FCS of its qualifying features, by maintaining or restoring:

- the extent and distribution of qualifying natural habitats and habitats of the qualifying species;
- the structure and function (including typical species) of qualifying natural habitats;
- the structure and function of the habitats of the qualifying species;
- the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- the populations of each of the qualifying species; and
- the distribution of qualifying species within the site.

6.14 In March 2019, Natural England released an updated site condition (vulnerability) assessment for the WNNC SAC. The Applicant's reservations with this assessment are identified in REP6-019. The assessment indicates, on a highly precautionary basis, that the Sandbanks qualifying feature of the SAC is largely in favourable condition and otherwise recovering: 72% Favourable, with 28% Unfavourable but recovering.

6.15 Table 2.2 of the Applicant's Submission REP6-019 provides detail of the assumed condition of all four sub-features of the Sandbanks feature. Only two (Subtidal Coarse Sediments and Subtidal Mixed Sediments) considered to be in unfavourable condition have any impact pathway with Hornsea Three (Subtidal Sands was considered to be in favourable condition).

6.16 Table 2.3 of REP6-019 identified the physical and biological attributes and associated targets for these two sub-features which are relevant to Hornsea Three and the confidence underpinning these judgements by Natural England:

- Hab_Att_3.01: Maintain/Recover the species composition of component communities;
- Hab_Att_2: Maintain/Recover the presence and spatial distribution of Subtidal Coarse Sediment/Subtidal Mixed Sediment communities according to the map.

[24] A fourth sub-feature, Subtidal Mud, is outside the Hornsea Three DCO boundary.

6.17 The confidence levels in the assessment for these two attributes potentially affected by Hornsea Three are both "low", due to the vulnerability assessment approach by Natural England, which requires that these attributes fail due to impacts from fisheries (see **REP6-019** for further discussion).

Flamborough and Filey Coast Special Protection Area ("FFC SPA")

Introduction

6.18 The FFC SPA was designated in 2018[25] and is located on the central Yorkshire coast. Of those features that are the reason for the selection of the site listed below, only one is relevant to the Consultation: kittiwake.

6.19 The FFC SPA consists of sea cliffs up to 135 m in height and cliff top grassland incorporating coastal cliffs between Filey Brigg and Cunstone Nab and a 2 km marine extension around the full extent of the SPA. The SPA is designated for a kittiwake population of 44,520 pairs, gannet (8,469 pairs), guillemot (41,607 pairs) and razorbill (10,570 pairs), and a breeding seabird assemblage of 216,730 individuals.

Conservation Objectives and Condition

6.20 The conservation objectives which apply to the FFC SPA as a whole and the individual features are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the FCS of its qualifying features, by maintaining or restoring:

- the extent and distribution of the habitats of the qualifying features;
- the structure and function of the habitats of the qualifying features;
- the supporting processes on which the habitats of the qualifying features rely;
- the populations of each of the qualifying features; and
- the distribution of qualifying features within the site.

6.21 Natural England's advice in respect of the relevant attributes (to collision impact) is in Table 6.3 below.

[25] Flamborough Head and Bempton Cliffs SPA was classified on 25 August 1998. On 23 August 2018 the site was extended and re-named Flamborough and Filey Coast SPA to reflect this. The features gannet (Morus bassanus), guillimot (Uria aalge) and razorbill (Alca torda) were also added in the amendment.

Table 6.3: Supplementary advice on Conservation objectives for the FFC SPA

Attribute	Objective	Notes
Breeding population: abundance	Restore	At the time of reclassification as the Flamborough & Filey Coast SPA there were approximately 44,520 breeding pairs of kittiwake. This was calculated using the 2008 Seabird Monitoring Programme (SMP) for Flamborough Head and Bempton Cliffs SPA which showed 37,617 pairs along the Flamborough Head section of the designation and a further 6,903 pairs from Filey Brigg to Cunstone Nab from surveys in 2009-2011 (Natural England, 2014). A single year full colony count taken in 2017 indicated 51,535 pairs across the whole of the SPA (Aitken et al., 2017). The original citation for Flamborough Head and Bempton Cliffs SPA specifies that the site supported 83,700 pairs of breeding kittiwake in 1987. Between 2009 and 2015 there are indications of a gradual downward trend in kittiwake productivity at Flamborough/Bempton. However, productivity at Filey Cliffs, whilst generally low, appears to have been relatively stable between 2012-2015 (Babcock et al., 2015). The target has been set to restore.
Supporting habitat: food availability	Restore	Evidence for the wider North Sea indicates that availability of sandeels is likely to be a factor in kittiwake decline. (Frederiksen et al., 2004) (Wanless et al., 2007). Recent evidence suggests that the decline in sandeel in the area around Flamborough may be attributable to fishing activity. It is also acknowledged that sea surface temperature rise (related to climate change) may be an additional factor in the reduction of sandeel availability. (Carroll et al., 2017) The target has been set using expert judgement based on knowledge of the sensitivity of the feature to activities that are occurring / have occurred on the site.

6.22 There has been considerable discussion over a number of years relating to the original size and in consequence the status of the kittiwake population at the FFC SPA including as part of the planning applications for previous projects in the former Hornsea Zone (including Hornsea Three, see APP-051) and for projects in the former East Anglia Zone (including Norfolk Vanguard and Norfolk Boreas). Natural England and JNCC maintain that the population of kittiwake at FFC SPA in 1987 of 83,700 pairs is correct. The restore objective for the breeding kittiwake population is based on the accuracy of this count.

6.23 The original count is considered by some to be high and has been questioned. For example, Dr John Coulson (Coulson, 2011) suggested the count is an anomaly, given the scale of increases required (which would have been exceptional), lack of comparable population changes elsewhere either locally or nationally and the demographic characteristics of the population. The applicant for Hornsea Project One noted similar reservations and these are noted in the Examining Authority's opinion on this matter in The Planning Inspectorate (2014) Hornsea Project One Examining Authority's Report of Findings and Conclusions and Recommendation to the Secretary of State)[26].

[26] The Planning Inspectorate (2014). Hornsea Project One Examining Authority's Report of Findings and Conclusions and Recommendation to the Secretary of State for Energy and Climate Change. [Online]. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010033/EN010033-002060-Hornsea%20Project%20One%20Recommendation%20Report.pdf (Accessed January 2020).

6.24 Regardless, the assessments produced for Hornsea Three by the Applicant (see, for example, APP-051) and the advice from Natural England (e.g. REP7-078) acknowledge and reflect that the population of kittiwake at FFC SPA is currently stable and/or increasing.

7. Hornsea Three Reduced MDS and Residual Effects

Context: The Rochdale Envelope

7.1 The Applicant has followed the Rochdale Envelope[27] approach, an established and necessary component of consent applications for offshore wind projects, where innovation and improvements in technology occur frequently, to reduce costs of electricity generation to consumers.

7.2 The MDS for Hornsea Three is, in many parameters, a highly precautionary reflection of the maximum scale and impact of Hornsea Three. That is particularly relevant for parameters which affect European sites (e.g. installation of maximum number of turbines, each with maximum extent of blades and each built to the minimum lower blade tip height). Similarly, the MDS scenario for cable protection is a conservative upper estimate of the **maximum** amount of cable protection which may be required in the SACs. The quantum of cable protection is likely to be less than the MDS.

7.3 In approaching the Applicant's assessment conclusions in the RIAA and elsewhere, and the advice of Natural England, it is important to have in mind that conclusions are geared towards absolute "worst case" scenarios. While each effect is possible in isolation, they are not necessarily likely, and some MDS scenarios are mutually exclusive (e.g. installation of export cables at landfall via HDD or open cut trenching). The probability of all MDS arising is low to nil. The maximum "worst case" impact from Hornsea Three will be less than the sum of the parts.

Reduced Maximum Design Scenario (MDS) for Hornsea Three

7.4 Further reductions to the MDS and additional mitigation for Hornsea Three have been made by the Applicant wherever feasible. These are set out in the Mitigation and Project Envelope Modifications note (Appendix 4 to Applicant's Response) and summarised in Table 7.1 below (see column C):

[27] The Rochdale Envelope arises from two cases: *R. v Rochdale MBC ex parte Milne (No. 1) and R. v Rochdale MBC ex parte Tew* [1999] and R. *v Rochdale MBC ex parte Milne (No. 2)* [2000].

Table 7.1: Reduced MDS for Hornsea Three (for parameters relevant to this document; Section 3 above)

Project Element	A	B	C	D
	MDS at submission of Application	***MDS at end of Examination***	***New MDS***	***Supporting Evidence on Environmental Implications***
Maximum No. of wind turbines	300	300	**231**	Appendix 4 to Applicant's Response, Annex B: Hornsea Three Revised Ornithological Mitigation Scenario. Refer to Table 2.12 of Appendix 4 Annex B for the implications of these changes on kittiwake at FFC SPA.
Total rotor swept area	No restriction	9 km^2	**8.8km^2**	
Minimum rotor tip height	34.97m above LAT (33.17m above MSL)	34.97m above LAT (33.17m above MSL)[28]	**41.8 m above LAT** (40m above MSL)	
Cable protection within European sites	Cable protection for remedial works: Up to 10% of length of each cable within each SAC. Cable protection for cable and pipeline crossings (NNSSR SAC only): associated with up to 20 cable crossings within the SAC.	Cable protection for remedial works: Up to 10% of length of each cable within each SAC. Cable protection for cable and pipeline crossings (NNSSR SAC only): associated with up to 20 cable crossings within the SAC.	Cable protection for remedial works n: **Up to 6%** of length of each cable within each SAC. Cable protection for cable and pipeline crossings (NNSSR SAC only): no change to MDS.	Appendix 4 to Applicant's Response, Annex C: Export Cable Protection Assessment for Marine Protected Areas. Refer to Tables 1.10 and 1.11 of Appendix 4 Annex C for the implications of these changes on SACs.

7.5 The Applicant has also made additional commitments relating to the NNSSR and/or WNNC SAC including:-

- **Sediment disposal**: The Applicant has proposed a set of principles to agree with Natural England and the MMO for the selection of disposal locations - details are set out in the Outline Cable Specification and Installation Plan (OCSIP) presented at Appendix 6 to Applicant's Response**.**
- **Sandwave Clearance**: The Applicant has reduced the MDS for volumes of sandwave material which would be disposed of within the WNNC SAC - see Annex D within Appendix 4 to Applicant's Response); and

[28] At ISH 7 and in subsequent submissions **REP07-30** and **REP7-031** two potential project refinements to reduce collision risk for birds were identified and explored: (i) raising lower tip height to 37.5 metres MSL; (ii) raising lower tip height to 40 metres MSL. The Applicant indicated that, on its position, neither was necessary but that the Applicant would have accepted an increase in lower tip height to 37.5m (MSL) if the ExA (in making its recommendation) or the Secretary of State (in making its decision) considered that to be necessary and proportionate.

- **Cable Burial**: The Applicant has affirmed a commitment to attempt to rebury cables which become exposed within the SACs before installing any cable protection – see Annex C within Appendix 4 to Applicant's Response.

7.6 All of the above are secured through amendments to dDCO requirements and/or DML conditions, or through updated versions of the relevant certified plans (e.g. the OCSIP), as appropriate. An updated version of the dDCO (track change and clean versions) reflecting the changes identified in column C of Table 7.1 above is provided at Appendices 9 and 10 to Applicant's Response.

7.7 The generating capacity of Hornsea Three is still expected to be at least 2.4GW, notwithstanding the changes to the MDS noted above[29]. As such, the benefits in terms of renewable energy generation capacity, job generation and investment are not reduced.

Implications for the European Sites

7.8 The implications of the reduced MDS for the relevant European sites is addressed in the Mitigation and Project Envelope Modifications note (Appendix 4 to Applicant's Response) and summarised in the following Table 7.2 and Table 7.3 below:

Table 7.2: MDS relative to NNSSR SAC

Element	MDS in Examination	Revised MDS	Change in Effects (if any)?
Cable protection measures (remedial protection)	197,400 m^2	118,440 m^2	Reduction of **40% - 78,960 m^2** in maximum cable protection footprint Revised MDS represents **0.01%** of the Annex I Sandbanks feature of the NNSSR SAC.
Cable protection measures (cable and pipeline crossings)	300,000 m^2	300,000 m^2 (unchanged)	
Total cable protection	497,400 m^2	418,440 m^2	

[29] Accepting that post consent there are a range of factors that will inform the end design taken forward into construction, not least commercial framework, market conditions and turbine technology availability at the point of procurement and construction.

Table 7.3: MDS relative to WNNC SAC

Element	MDS in Examination	Revised MDS	Change in Effects (if any)?
Cable protection measures (remedial protection)	46,200 m^2 (Assuming up to 10% of cables within the SAC may require remedial protection)	27,720 m^2 (Assuming up to 6% of cables within the SAC may require remedial protection)	Reduction of maximum footprint of cable protection within the WNNC SAC by **41%** (**18,840** m^2). Revised maximum design scenario represents **0.0026%** of the Annex I Sandbanks feature of the WNNC SAC.

Table 7.4: Comparison between collision risk estimates for kittiwake at FFC SPA.

		Parameter scenario		
		Applicant	Natural England	Examining Authority
Collision risk estimate apportioned to FFC SPA (upper and lower confidence intervals) for Hornsea Three alone	Examination: 33.17 m MSL lower rotor height[30]	7 (4-10)	181 (112-257)	13-15 (8-9 to 18-21)
	Examination:37.5 m MSL lower rotor height	5 (3-7)[30]	119 (74-169)[30]	10-11 (6-7 to 14-16)[31]
	Reduced MDS scenario: (reduction in rotor swept area to 8.8 km^2, reduction in number of turbines to 231 and increase lift to 40 m MSL lower rotor height)	4 (3-6)	65-73 (40-46 to 91-104)	7-9 (5-5 to 11-12)
% reduction (33.17 m lower rotor height to reduced MDS scenario of 40 m above MSL)		**40.9**	**59.4**	**41.4**
% reduction (37.5 m lower rotor height to reduced MDS scenario of 40 m above MSL)		21.2	38.4	21.9

7.9 The Applicant considers that, on any of the above CRM parameters, the resultant worst case collision rates for the reduced MDS are of insufficient magnitude to lead to an AEOI of the kittiwake feature of the FFC SPA alone or in-combination.

[30] As set out in REP7-031
[31] As set out in REP9-047

7.10 In this context, the Applicant notes that the in-combination collision rate for the Applicant's interpretation of Natural England's position (which is considered to be highly precautionary, see section 9 below) is lower than or comparable to that approved by the Secretary of State for East Anglia THREE and Hornsea Project Two.

8. Approach to Permanent Small-scale Impacts

Hornsea Three Impacts are Small-scale

8.1 Applying the very precautionary (worst case) revised MDS scenario, the maximum potential impact to the Sandbank features of each SAC would equate to only **0.01%** of the total area of the NNSSR SAC and **0.0026%** of the total area of WNNC SAC. That is a small-scale impact. The Applicant considers the reduced MDS for cable protection is *de minimis* and/or inconsequential.

Natural England's Advice

8.2 With regard to small scale habitat loss within SACs, the Applicant understands that Natural England does not advocate a specific threshold for habitat loss beyond which they consider AEOI is likely. It is also understood that while Natural England understandably start from a precautionary position, which may presume that permanent and irreversible or long-lasting loss is likely to be an AEOI, that presumption is rebuttable and Natural England accepts there is a threshold below which small-scale impacts are not an AEOI.

8.3 Specifically, Natural England advise (REP7-077) 'Note on Small Scale Impact' that it would consider there is no likelihood of an AEOI where any of the following can be demonstrated:

- That the loss is not on the priority habitat/feature/ sub feature/ supporting habitat, and/or
- That the loss is temporary and reversible[32], and/or
- That the scale of loss is so small as to be de minimus, and/ or
- That the scale of loss is inconsequential including other impacts on the site/ feature/ sub feature.

Compliance with Natural England's Advice

8.4 The Applicant considers at least three, if not all, of the above conditions are met in the case of Hornsea Three.

8.5 The Sandbank feature is not a "priority habitat", it is a widespread feature in the context of the southern North Sea. Within the WNNC SAC, it is largely in favourable condition. Within the NNSSR SAC, confidence in the condition assessments is low, so it assumes the worst. In any event, an MDS of cable protection affecting up to a maximum of 0.01% on the Annex I Sandbank feature can properly be regarded as *de minimis* and/or inconsequential (noting that for the WNNC SAC, the proportion of the Annex I sandbanks feature affected is considerably smaller; 0.0026%).

[32] It is understood by the Applicant that Natural England advise that for loss to be considered temporary it must be clearly time-limited to the point where the impact is predicted to return to the same pre-impact condition and must include a detailed remediation plan using proven techniques as part of the licence

8.6 If it is assumed that cable protection is left in situ during decommissioning (i.e. permanent habitat loss), the base assumption used in the RIAA (APP-051), it can be concluded that this would not result in an AEOI.

8.7 Therefore, it is not necessary to accept the Applicant's position in relation to decommissioning and 'reversibility' to reach a conclusion of no AEOI. However, if the Applicant's commitment to decommission cable protection and supporting evidence is accepted by the Secretary of State, the effect of cable protection on the Annex I Sandbanks features of the WNNC and NNSSR SACs is predicted to be long-lasting, but temporary (i.e. time-limited) and reversible. The Applicant's evidence in relation to the feasibility of decommissioning and reversibility is presented in REP6-018.

8.8 Natural England has not advised on what quantum of cable protection (aside from zero) within the relevant SACs would be de-minimis and/or inconsequential and therefore acceptable in this case. Logically, since Natural England accept in principle there is a threshold (above zero) at which small-scale impacts can be regarded as *de minimis* and/or inconsequential, even for permanent impacts, there is a quantum of protection within the SACs which would not give rise to an AEOI.

8.9 In the absence of specific advice from Natural England on a defined threshold for AEOI, it is for the Secretary of State to determine the AEOI threshold and the extent to which an AEOI arises. It is open to the Secretary of State to accept the Applicant's position that the reduced footprints within NNSSR SAC and WNNC SAC are *de minimis* and/or inconsequential.

9. Inherent Over-precaution of In-combination Position for Kittiwake

9.1 Impact assessments are sequential in nature (i.e. baseline, identification of maximum project envelope, assumed worst case scenarios, effect estimation, assessment of population consequences). There is a tendency to add precaution at each stage. For example, focussing attention on the upper limits of each component. This ensures assessments over, rather than under, estimate impacts.

9.2 However, if this compounding effect is not recognised, it results in conclusions that are disproportionately negative and over-estimate effects. That distorting effect is compounded when project-level effects are combined in cumulative and in-combination assessments.

9.3 Collision risk assessments have been produced following Natural England advice (REP6-043). However, combining worst case assumptions and upper confidence estimates, as recommended by Natural England, leads to over-estimates of magnitude of predicted effects and any subsequent conclusions on the implications for focal populations.

9.4 The Applicant previously provided evidence to demonstrate that the assessments conducted as part of offshore wind farm consent applications are, in general, highly conservative. In particular, NIRAS (REP4-049) presented detailed discussion on over-precaution in offshore wind farm ornithology assessments, with the key issues with respect to collision assessment summarised below:

Table 9.1: Over-precaution inherent to collision risk for offshore wind

Issue	Analysis
Use of collision estimates calculated for consented wind farm designs in the cumulative and in-combination totals	Most wind farms have obtained consent for designs based on a large number of smaller dimension turbines, when in reality the built windfarm comprises fewer, larger turbines – predominantly reflected in the advancements the wider industry makes in turbine technology between consent application and construction The consequence is that predicted mortality for the consented project in the EIA and HRA overestimates the predicted mortality for the wind farm that is built. Work conducted to investigate this (Trinder 2017) found that the reduction in predicted mortality was around 17% when project-specific adjustments were made. The Applicant provided an updated version of this analysis (REP1-148) and showed that when the worst case scenario has been identified for each project (i.e. there is no potential for collision risk estimates to increase) a reduction of approximately 13% would occur.
Flight speeds for kittiwake	Recent studies have reported slower flight speeds for kittiwake (e.g. approx. 8.7 m/s; Skov et al. 2018) compared with the value which has previously been assumed for use in collision modelling (13.1m/s). Reducing the value for flight speed entered in the collision model reduces the predicted number of collisions (e.g. by around (26)% for a reduction from 13.1 m/s to 8.7 m/s-). Reductions would apply not only to Hornsea Three but to all previous wind farm estimates in the same manner as the reduced nocturnal activity.
Over-estimated nocturnal activity	Most wind farm collision assessments have used over-estimates of nocturnal activity. For example, the Applicant calculated in APP-109 that, for kittiwake the use of an empirically derived nocturnal activity factor would reduce collision risk estimates by approximately 16%.
Preference for generic flight height data over site specific flight height data/Band model.	Site-specific flight height data collected as part of boat-based surveys conducted to inform the Hornsea Project One and Two applications (with these surveys covering the Hornsea Three area) suggest only a small proportion (less than 1%) of kittiwake flight heights occur at a heights consistent with the rotor swept area at Hornsea Three whereas the generic data (Johnston *et al.,* 2014) indicates a much higher proportion at rotor swept height. For this reason, the Applicant considered that collision risk estimates calculated using Option 1 (Basic model version and site-specific flight height data) provided the best estimate for collision risk at Hornsea Three (although in APP-051 collision risk estimates calculated using Options 1, 2 and 3 were assessed). It is noted that the ExA also requested collision risk estimates calculated using Option 1. However, for Hornsea Three, Natural England advocate the use of Option 2, which uses the Basic version of the model together with generic flight height information. That results in collision risk estimates that are significantly higher, without any evidence that kittiwakes fly at the altitudes suggested by the generic data at Hornsea Three.
Highly precautionary assumptions associated with breeding season apportioning for breeding adult birds from FFC SPA.	Natural England advocated the use of a 93.1% apportioning rate during the breeding season for breeding adult birds from FFC SPA. This value does not take into account immature birds (the majority of which are indistinguishable from breeding adult birds) or non-breeding birds (which may represent a considerable proportion of the birds present at Hornsea Three). There is considerable evidence, including site-specific work presented in Cleasby *et al.* (2018) (REP1-144), which substantiates a much lower usage of the Hornsea Three array area by kittiwake from FFC SPA.

Issue	Analysis
Advocating use of predictions using upper confidence intervals.	Natural England requested additional assessment using the upper confidence intervals, alongside that based on the average values. Using the upper confidence level is not a statistically robust approach. The range of possible values between the upper and lower 95% confidence intervals indicate that there is a 95% confidence that the true value will fall within that range with a higher likelihood of those values in the centre of the range (i.e. the mean estimate) than those towards the upper and lower values, assuming a normal distribution.
Under-estimated avoidance rates	There is evidence that for some species the currently advised avoidance rates are too low. Bowgen and Cook (2018) used the data collected and reported in Skov et al. (2018) to derive an empirical avoidance rate for kittiwake of 99.0% (which reduces collision estimates by 9% compared with the current value of 98.9% advocated by Natural England).
Seasonality	The Applicant and Natural England applied different seasonal extents for kittiwake. Natural England advocate the inclusion of March and August as part of the breeding season for birds from FFC SPA whereas the Applicant advocates April to July for the breeding season. The Applicant does not suggest that kittiwake would not be present at FFC SPA during March and August but considers it is more scientifically robust (whilst still precautionary) to base the breeding season for kittiwake on site-specific information[33]. In addition, the Applicant was able to use information provided by the RSPB to show that breeding behaviour (i.e. nest building) starts in April and not March, as contended by Natural England (see REP4-012).

9.5 If the above sources of precaution are considered together (reduction of c. 13% for built vs. consented wind farms; reduction of c.16% for lower nocturnal activity rates; reduction of c. 26% for slower kittiwake flight speed and reductions of 9% for kittiwake avoidance rates), it is clear the collision estimates will be greatly reduced.

9.6 Each individually represents very significant precaution in the assessment for kittiwake. When that is then combined, the position goes beyond precaution; the assessments are over-precautionary. When one looks at in-combination, the position is particularly acute. As a consequence, the conclusions of the updated assessments considerably over-estimate impact magnitudes (a matter recorded through the examinations of numerous Offshore Wind Farms, including but not limited to Norfolk Vanguard - REP8-067 to Norfolk Vanguard examination Deadline 8 Submission - Offshore Ornithology Precaution in ornithological assessment for offshore wind farms).

9.7 These issues can lead to unnecessary AEOI conclusions (based on over-precaution) and have implications for the HRA Derogation Provisions, and may mean that more compensation than is necessary is secured.

[33] Noting also that these seasons informed Natural England's final position at Hornsea Project Two (**APP-054**).

9.8 DEFRA 2012 advocates that compensation mechanisms should be flexible to ensure adequate compensation without going further than necessary. This advice recognises[34] that, in some cases, compensation arrangements will need to cater for uncertainty over the harm that might be caused by a proposal, e.g. if "*anticipated harm to a site proves to be less than anticipated, or compensation measures are more successful than expected*". It concludes: "*Habitats legislation should not be used to force applicants to over-compensate*".

9.9 In conclusion, the best available evidence must be used. Where such evidence exists, there is no need for, or reason to, add additional precaution. It is in areas where evidence is limited that the precautionary principle applies. Even in those areas, it is important to avoid over-precaution, materially over-estimating impacts. Doing so will jeopardise existing projects and compound problems for future offshore leasing rounds which in turn will have to make assessment using that in-combination baseline.

10. Summary

10.1 This Part (Part 1) of the Applicant's Response to the Consultation has set out the legal and factual matrix required to apply the HRA Derogation Provisions should that be considered necessary by the Secretary of State.

A reduced MDS with reduced impacts on European sites

10.2 It has confirmed the reduction in the MDS for Hornsea Three and consequent reduction in the worst-case potential impact for the relevant features of the European sites as follows:

- **NNSSR SAC:** reduced maximum footprint of cable protection by 78,960 m^2 (40%) to a MDS which represents **no more 0.01% of the Annex I Sandbanks feature**.
- **WNNC SAC**: reduced maximum footprint of cable protection by 18,840 m^2, to a MDS which represents **no more than 0.0026% of the Annex I Sandbanks feature**[35]**.**
- **FFC SPA**: Reduced annual collision rates (project alone) (4 collisions/annum if the Applicant's CRM parameters are applied) to **no more than 0.01% of breeding population** (Applicant's parameters; alternatively, 0.017% of breeding population using the ExA parameters and 0.07 – 0.08% of breeding population using the Applicant's interpretation of Natural England's parameters).

10.3 The Applicant considers that the resultant worst-case impacts for the revised MDS are of insufficient magnitude to lead to an AEOI in respect of any of the above European sites.

[34] See paragraph 103.
[35] With respect to the sub-features of the Annex I Sandbanks feature, the proportions are similarly small: no more than 0.0048% of the Subtidal Sand affected, no more than 0.077% of the Subtidal Coarse Sediment affected and no more than 0.0036% if the Subtidal Mixed Sediment.

Impacts Based on Highly Conservative Assessments & Advice

10.4 Part 1 above also places that reduced impact in its proper context, noting amongst many other factors:

NNSSR and WNNC SAC	FFC SPA
The Hornsea Three MDS (used for the assessments) is a highly precautionary reflection of the maximum scale of Hornsea Three: what is eventually built would fall within and (as has historically been the case) is likely to be less than the MDS.	
No loss or harm to any priority habitat in respect of the SACs.	No direct impact on or loss of SPA habitat; array area some 149km distant from FFC SPA.
The current condition assessment of the SACs informed by concern related to particular pressures, driven by other sectors.	Legitimate disagreement between the Applicant, ExA and Natural England on the appropriate CRM parameters including the degree of connectivity between the Hornsea Three array area and FFC SPA (and related apportioning assumptions).
In the case of the WNNC SAC, Sandbanks feature is largely in favourable condition (72%) or otherwise recovering.	In-combination collision rate for the Applicant's interpretation of Natural England's position (which is considered to be unnecessarily precautionary) is lower than or comparable to that approved by the Secretary of State for East Anglia THREE and Hornsea Project Two.
Natural England's advice on small-scale nature of the cable impacts and acknowledgement that permanent impacts can be *de-minimis* if sufficiently small in scale.	Inherent over-precaution that underpins the collision risk assessments and conclusions on impact in respect of kittiwake, particularly in-combination assessments and conclusions.

10.5 For all these and other reasons summarised the Applicant is confident it can safely be concluded, beyond reasonable scientific doubt that Hornsea Three would not give rise to any AEOI, alone or in combination.

10.6 Should the Secretary of State conclude otherwise, it is considered that any AEOI finding in respect of any of the relevant European sites would be marginal, based upon highly precautionary assumptions. This is relevant to Parts 2 and 3 below which demonstrate in detail how the requirements of the HRA Derogation Provisions can readily and clearly be met, in the marginal circumstances of Hornsea Three.

No Alternative Solutions

10.7 **Part 2** of this submission (**Report to Demonstrate No Alternatives**) demonstrates that, taking account of the need and legitimate project objectives, there are no feasible alternative solutions to Hornsea Three, in the context of the identified effects on FFC SPA, the NNSSR SAC and/or the WNNC SAC.

10.8 A large range of potential alternative options have been identified, considered and discounted, ranging from doing nothing, to alternative sites, routes, designs, scales and working methods.

IROPI

10.9 **Part 3** of this submission (**Report to Demonstrate IROPI**) sets out a compelling case that Hornsea Three must be carried out for IROPI.

10.10 In brief, Hornsea Three can substantially contribute to the UK's legally binding climate change targets by helping to decarbonise the UK's energy supply, whilst also 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.

10.11 Hornsea Three would also provide substantial employment opportunities and skills development, particularly in coastal communities, whilst also playing a major role in supporting the UK's supply chain.

Necessary Compensatory Measures

10.12 The standalone compensatory measures (Appendix 2 to Applicant's Response) sets out a range of feasible measures for compensation focused on invasive mammalian predator eradication (and biosecurity), blue mussel bed restoration (and biosecurity), litter removal and in the event of failure, eelgrass restoration or litter / debris removal.

Shadow HRA Derogation Case

Part 2: Report to Demonstrate No Alternative Solutions

1. Introduction and Scope

1.1 This Part of the Applicant's Response to the Consultation provides evidence and information which demonstrates that the Secretary of State can be satisfied that there are no feasible alternative solutions to Hornsea Three.

2. Structure & Content of this Report

2.1 The Applicant has adopted an approach which considers the potential alternative solutions in a structured and sequential process, following five principal steps, as follows:-

Table 2.1: Stepped Approach to Consideration of Alternatives

STEP	DETAIL	REPORT SECTION
Step 1	Identify need and core project objectives for Hornsea Three	Section 4
Step 2	Identify relevant works and potential residual harm to European sites	Section 5
Step 3	Identify alternatives that can be immediately discounted	Section 6
Step 4	Consider feasibility of remaining potential alternative options	Section 7
Step 5	Assess and compare impact of any feasible alternative solutions on national site network	Section 8

2.2 The approach adopted by the Applicant outlined above draws from and is based on the key principles and parameters summarised in **Section 3** below, which are explained and justified in more detail, by reference to case law, guidance and other precedent as appropriate, in Annex A of this document (*Case Law, Guidance and Previous Decisions on Alternative Solutions*).

2.3 While the feasibility of alternative solutions must be considered prior to considering whether Hornsea Three must proceed for IROPI, there is overlap between the alternatives and IROPI stages of the HRA Derogation Process: both are underpinned by consideration of the need that Hornsea Three addresses. As such, both this Part 2 (Report to Demonstrate No Alternatives) and Part 3 (Report to Demonstrate IROPI) draw on and cross refer to the Statement of Need for Hornsea Three prepared by Simon Gillett at New Stream Renewables (Annex C).

3. Approach to Alternative Solutions

3.1 The Habitats Regulations do not define "*alternative solutions*"[36] and there is limited case law at UK or EU level: relevant case law is considered further in Annex A (*Case Law, Guidance and Previous Decisions on Alternative Solutions*).

3.2 In the absence of a prescriptive statutory framework or case law, the approach adopted by the Applicant has been developed drawing upon relevant EC opinions[37], UK and EC guidance (principally DEFRA 2012[38] and MN 2000[39]) and UK planning decisions, including the Able Marine Energy Park decision. It is acknowledged that such opinions, guidance and planning precedent while useful are not binding on the Secretary of State.

3.3 In summary, the Applicant has distilled the following key principles that are considered to apply when considering whether it is possible to resort to alternative solutions, which have in turn informed the approach adopted by the Applicant (outlined in Table 2.1 above):

- The consideration of alternatives can be approached as a multi-staged or stepped process.
- The first step is to identify the relevant objective(s) which any alternative would need to address. That requires an understanding of the need and public benefits which the project is designed to address (e.g. as described in Government policy).
- The project objective(s) that frame the search for alternatives can legitimately be narrow in scope, provided they are genuine and important.
- Conversely, the notion of alternatives cannot reasonably be cast so wide by reference to an abstract "aim" or "problem", so as to include any and every possible alternative strategy. It is in the context of a given project that the alternatives question arises.
- The need and project objective(s) identified as set out above frame the consideration of any alternatives – options which do not address the need and/or fail to meet the objective(s) are not an "alternative solution".
- The "do nothing" option should be considered but will not be an alternative solution (unless the need and project objectives can be delivered by doing nothing).
- It is not necessary to consider every theoretically imaginable alternative. The Secretary of State is entitled to discount alternatives that are obviously out of the question or improbable without the need for detailed assessment.
- The detailed consideration of alternatives should be limited to options which are demonstrably feasible: financially, legally and technically.

[36] The phrase is also not defined in the Habitats Directive.
[37] EC opinions may be persuasive but do not constitute binding EU judgements.
[38] Habitats Directive: guidance on the application of article 6(4), published by DEFRA in December 2012
39 Managing Natura 2000 Sites - The provisions of Article 6(3) of the 'Habitats' Directive 92/43/EEC (2000), published by the EC in 2000, as updated in November 2018.

- Consideration of cost and viability is a relevant and legitimate consideration in determining feasibility. Alternative solutions need not be equivalent in cost, but additional costs should not be such that the alternative becomes undeliverable or unviable.
- If after applying the stages/ steps above a number of feasible alternatives have been identified, those should be subject to further consideration in terms of their relative effects on the integrity of the national site network, as compared to the project in question.
- At this final stage (comparison of feasible alternatives), feasible alternative solutions which are likely to give rise to similar adverse effects on the European site concerned, or the national site network, can be discounted.
- Finally, the availability of a feasible alternative solution with a lesser effect on integrity is not necessarily decisive. The principle of proportionality applies. An alternative providing marginal reduction in harm for corresponding material loss of public benefit may not be a proper alternative.

4. STEP 1: Need & Objectives for Hornsea Three

The Clear and Urgent Need for Hornsea Three

4.1 Climate change is the defining challenge of our time. The impacts of climate change are global in scope and unprecedented in human existence. By definition, an emergency demands an immediate response.

4.2 Hornsea Three is a major renewable energy infrastructure project which responds to that imperative. It enacts fundamental and urgent national objectives articulated at the highest level in legislation and policy documents. That includes but is not limited to the Climate Change Act 2008, the Overarching National Policy Statement for Energy (**EN-1**) and the NPS for Renewable Energy Infrastructure (**EN-3**) amongst others.

4.3 The Applicant's Response to the Consultation includes a Statement of Need for Hornsea Three, prepared by Simon Gillett[40]. This updates and complements the evidence base which supports EN-1 and EN-3 and demonstrates that wind generation is not only economically and technically viable, that that it is economically competitive, proven and deliverable within relatively short timeframes, to the GB electricity consumer.

4.4 Cost reduction and affordability are particularly important in the context of offshore wind farm development. UK Government policy and regulatory objectives seek to ensure affordability to consumers, through the Contract for Difference (**CfD**) auction process (generation assets) and OFTO (Offshore Transmission Owner) regime (offshore transmission assets). In broad terms, both seek to incentivise investment in low carbon electricity generation and transmission assets, ensure security of supply and help the UK meet its emission reduction and renewables targets, whilst reducing (and not increasing) cost to the consumer.

[40] Mr Gillett has European energy sector experience, spanning 20 years of commercial, analytical and consulting roles within Utilities and the Oil & Gas sector.

4.5 The key summary points are as follows:

Table 4.1: Key Components of Need Case

No.	Details
1	Decarbonisation is a UK legal requirement and is of global significance. It cannot be allowed to fail, and urgent actions are required in the UK and abroad, to keep decarbonisation on track to limit global warming.
2	Wind generation is an essential element of the delivery plan for the urgent decarbonisation of the GB electricity sector. This is important not only to reduce power-related emissions, but also to provide a timely next-step contribution to a future generation portfolio, which is capable of supporting the decarbonisation of transport and heat sectors, through electrification.
3	As part of a diverse generation mix, offshore wind contributes to a secure GB generation mix through providing bulk low-carbon power from indigenous and renewable sources. Although variable, system operators continue to develop ways of integrating high penetrations of renewables while balancing the grid.
4	Internationally, and importantly GB is leading in this regard, offshore wind generation assets are getting bigger and cheaper, providing a real-life demonstration that size and scale works for new offshore wind, and providing benefits to consumers in the process. Other low-carbon generation (e.g. tidal, nuclear or conventional fossil fuels with CCUS) remain potential contributors to achieving the 2050 Net-Zero obligation, but their contributions in the 2020s, when existing nuclear and coal-fired powered stations are due to be decommissioned, is likely to be low.
5	Offshore wind is already cost competitive against other forms of conventional and low-carbon generation (with the latest UK projects obtaining strike prices as low as £39.65/MWh in Auction Round 3 in 2019), both in GB and more widely.

4.6 These important benefits of offshore wind generation in GB apply specifically to Hornsea Three:

Table 4.2: How Hornsea Three Addresses the Need

No.	Details
1	Hornsea Three is a substantial infrastructure asset, capable of delivering a significant volume of low-carbon electricity (at least 2.4GW), enough to power in excess of 2 million UK homes from the mid-2020s. This is in line with advice from the UK's Committee on Climate Change (CCC), which highlights the need for urgent action to increase the pace of decarbonisation in the GB electricity sector and the UK Government's ambition to deliver 40GW of offshore wind by 2030, which represents a quadrupling of the UK's offshore wind capacity within a decade.
2	Hornsea Three will make a significant contribution to the UK's energy security and decarbonisation needs during the 2020s. Hornsea Three's connection to the national grid means that it will be required to play its part in helping National Grid manage the electricity system. This includes participating in the wholesale balancing markets including but is not limited to; helping balance supply and demand on a minute-by-minute basis; providing essential ancillary services); and providing visibility of its expected generation.
3	Maximising the capacity of generation in the resource-rich, accessible and technically deliverable (former) Hornsea Zone, is to the benefit of all GB consumers, and the wind industry generally. The project is technically and economically feasible.

4.7 In summary, through the delivery of at least 2.4GW, Hornsea Three would deliver a substantial, near-term contribution to GB's decarbonisation objectives and security of supply, with highly competitive pricing per MW/h, thus helping to lower bills for consumers throughout its operational life, addressing all important aspects of existing and emerging Government policy. It will also bring wider benefits, as discussed within Part 3 (**Report to Demonstrate IROPI**).

The Core Objectives of Hornsea Three

4.8 It is plain from the need described above that offshore wind must be deployed urgently, at scale.

4.9 The environmental (decarbonisation), regulatory, market and economic factors summarised above drive and are fundamental to the core project objectives for Hornsea Three, set out in Table 4.3 below:-

Table 4.3: Core project objectives for Hornsea Three

ID	Objectives	Basis for the Objective
Project-wide (Government policy and social demand)		
1	**Support decarbonisation and security of supply by developing a large-scale offshore wind farm**	• Significant new offshore wind generation capacity is essential to help the UK meet its legally binding net zero commitment and carbon budgets. • A large-scale offshore wind farm responds to the urgent need for greater volumes of low carbon electricity, as established by NPS EN-1 and EN-3 and more recently the UK's Clean Growth Strategy and Offshore Wind Sector Deal. • A large-scale offshore wind farm in the former Hornsea Zone is consistent with national policy and offers the potential to maximise low-carbon generation from the significant wind resource found in that location. Development at scale also supports: • diversity of generation profile of wind generation assets in GB; • diversity in supply; • security of electricity supply in the UK in a cost-effective way; and • economies of scale which enables cost efficiencies and low cost to the consumer.
2	**Develop a project at low cost to consumer**	• The CfD scheme is the government's main mechanism for supporting low-carbon electricity generation. CfDs incentivise investment in renewable energy by providing developers with greater certainty and stability of revenues by reducing exposure to volatile wholesale prices. • CfD allocation is subject to a competitive tender mechanism, whereby projects must submit 'sealed bids' in an auction for a fixed quantity of funding. This competitive auction mechanism is driving sharp reductions in the cost of offshore wind. For example, in 2015 East Anglia One obtained a strike price of £120/MWh in Auction Round 1, with the latest projects obtaining strike prices as low as £39.65/MWh in Auction Round 3 in 2019. Successful participation in future CfD auction round necessitates bringing forward a strong, viable and competitive project by securing consent for an MDS that facilitates: • technological innovation, such as larger turbines, increased export cable capacity and the ability for the promoter to utilise the full market potential when selecting key items – such as the transmission system; • adoption of optimum engineering solutions to increase efficiency and decrease costs; and • benefit from economies of scale and benefit from a reduced generation cost per MWh.

ID	Objectives	Basis for the Objective
Project-wide: Timing		
3	**Deliver a significant volume of offshore wind in the 2020s (Hornsea Three could generate power from Q4 2025 / Q4 2026)**	• In March 2019, the UK Government committed to deliver 30GW of offshore wind by 2030 as part of the Offshore Wind Sector Deal[41]. This target was increased to 40GW in December 2019, in supplementary documents to the Queen's speech. • Offshore wind farms typically take at least 4 years to transition through the development phase and then at least 3 - 4 years to transition through the construction phase. Projects not currently in planning (DCO consenting) or development are unlikely to be in operation by 2030. • In the context of the delivery timescales associated with other technologies, Hornsea Three is uniquely able to narrow the potential "generation gap" between 2025-2035. Generating power from Q4 2025 / Q4 2026 ensures Hornsea Three will contribute to meeting the urgent need and supporting offshore windfarm ambitions promoted by Government - with time being of the essence in tackling climate change.
Project-wide (Geographic Location)		
4	**Promote further offshore wind farm, through Round 3 offshore wind leasing round, via further development within former Hornsea Zone**	• Through leasing rounds, developers are limited to bidding for sites or zones (e.g. Round 3), identified by The Crown Estate (**TCE**). • Qualifying sites and projects are limited to offshore wind technology. • TCE has no current or planned offshore leasing rounds for any renewable technology other than offshore wind. • Sites outside former Hornsea Zone or the established Round 3 leasing sites are not available to the Applicant and not deliverable within the identified timescales (**see ID 3 above on timing**). • This approach utilises and seeks to optimise available seabed already identified, through Strategic Environmental Assessment (**SEA**) and plan-level HRA, in respect of the third offshore wind leasing round, as among the least constrained around the UK for a rapid increase in offshore wind deployment at scale.
5	**Develop the eastern portion of the former Hornsea Zone, (due east of Hornsea One and Hornsea Two)**	• TCE had a target capacity of 4GW of generating capacity within the former Hornsea Zone, to be met through the development of several offshore wind farms. This target has not yet been achieved (Hornsea Project One and Two have a combined capacity of c.2.6GW). • Optimises development opportunity within the former Hornsea Zone through the identification of the most technical and environmentally suitable development sites. • Development of the former Hornsea Zone within the constraints across the former zone identified through zone appraisal and planning process, to ensure a scheme that can be delivered safely and efficiently, while minimising impacts[42]. • Considering the Hornsea Project One and Two boundaries, develop the most suitable remaining areas within the former Hornsea Zone taking into account a range of constraints including (but not limited to) oil and gas, ornithology, ground conditions and other technical criteria.

[41] BEIS (March 2019). Offshore Wind Sector Deal. Available online: https://www.gov.uk/government/publications/offshore-wind-sector-deal/offshore-wind-sector-deal.
[42] APP-059 - 6.1.4 ES Volume 1 - Ch 4 - Site Selection and Consideration of Alternatives, Zone Appraisal and Planning process.

ID	Objectives	Basis for the Objective
6	**Develop an array which makes efficient use of available seabed within the eastern portion of former Hornsea Zone**	Within the limits of the dDCO, bring forward strong, viable project that: • Optimises wind capture across the array. • Minimises wake loss through creating efficient layouts and WTG positioning. • Optimises array cable, interconnector and export cable layouts. An array layout that:- • Responds to variable water depths. • Responds to variable site conditions, including but not limited to areas where geotechnical and ground conditions may not lend themselves to efficient WTG installation. • Provides for array layout principles which respond to maritime, aviation and search and rescue objectives. • Provides for appropriate setbacks from established oil and gas operations, pipelines and other existing assets and hard constraints. • Provides for Archaeological Exclusion Zones.
7	**Make efficient use of available grid connection capacity**	• Identification of an economic and efficient national grid connection point, including network reinforcements that may be needed. • Consideration of connection capacity available to allow delivery within suitable timeframes (see **ID 3 above**), and anticipated connection date. • A project must be suitably sized to justify the extended distance between point of generation and pointy of grid connection. • Limit the need for extending the national grid network (and potentially the deployment of overhead lines). • A project which did not utilise the full grid connection capacity available / offered to Hornsea Three would be sub-optimal.
8	**Secure consent which allows construction in either one or two phases**	The consent needs to be flexible to ensure deliverability under the current CfD framework and maximise the site's generating potential capacity.
Offshore Transmission Infrastructure		
9	**Secure consent to allow AC or DC transmission technology, to ensure delivery in first half of 2020**	• A project envelope that allows for both HVAC and the High Voltage Direct Current (HVDC) transmission system – providing for the current "tried and tested" transmission system (HVAC) – used by all operating UK offshore wind farms and considered essential to ensure deliverability of Hornsea Three in a competitive market and a low cost of energy to the UK consumer and emerging transmission system (HVDC)[43] • Minimises risk of delay to delivery of the project and risk of jeopardising deliverability of the projects (by retaining the opportunity to select the optimum transmission system available).

[43] REP1-164 Appendix 22 Transmission System (HVAC/HVDC) Briefing Note.

ID	Objectives	Basis for the Objective
10	**To utilise the shortest and straightest feasible export cable corridor route from the offshore array area to landfall site**	• Deliver an efficient offshore export cable connection routing between the array location within the former Hornsea Zone (see **ID 5 above**) and identified grid connection point (see **ID 7 above**), based on suitable landfall locations[44] • Avoidance, where possible of environmental constraints. • Seek a route as close as feasible to "ideal" straight-line approach to minimise length but subject to avoiding or minimising interactions with key physical and environmental constraints. • Development of an offshore export cable route that accommodates engineering limitations[45]. • Avoid areas of sea bed use, including but not limited to offshore infrastructure, aggregate areas, military practice areas, dredging areas, dumping grounds (military).
11	**To be delivered in a safe and efficient manner**	• Ensure health, safety and environment (HSE) considerations are foremost in design development, equipment selection, installation procedures and ongoing operation and maintenance activities. • Design and management of a scheme does not give rise to unsatisfactory risk to other sea users.

5. STEP 2: Relevant Works and Residual Potential Harm

5.1 The Secretary of State has confirmed that the evidence and submissions in respect of the HRA Derogation Provisions should be limited to the following:

Table 5.1: Relevant European sites and Features Potentially Affected

European Site	Relevant Qualifying Feature	Relevant Impact from Hornsea Three
NNSSR SAC	"*sandbanks slightly covered by water at all times*"	Placement of cable protection on seabed
WNNC SAC	"*sandbanks slightly covered by water at all times*"	Placement of cable protection on seabed
FFC SPA	breeding kittiwake feature	Collision risk

5.2 For the "*sandbanks slightly covered by water at all times*" feature, the identified impact is long-term or permanent habitat loss as a result of the placement of cable protection on the seabed, either where cable burial has failed or in connection with cable crossings.

5.3 Activities as part of the MDS relevant to this impact are:

[44] Site Selection - Stage 3 "Identification of grid connection location and strategic landfall assessment" (**APP-092**).
[45] APP-093 Annex 4.2 – Selection and Refinement of the Offshore ECR and HVAC Booster Station

(i) the export cable route and the areal extent of its overlap with the sandbank feature,
(ii) the number of required export cables,
(iii) the number of cable crossings required; and
(iv) extent to which burial is unsuccessful such that cable placement is required to protect the cable.

5.4 Changes (i.e. alternatives) to any other aspect of the MDS for Hornsea Three would have no bearing on cable protection impacts on sandbanks and cannot be alternative solutions.

5.5 In respect of kittiwake the identified impact is collision risk, which arises from the operation of the wind turbines during the operational period. The primary aspects of the MDS relevant to or which may influence collision risk during operation are:

(i) array location (relative to FFC SPA),

(ii) number of turbines,

(iii) maximum rotor swept area,

(iii) height of turbine blades above sea surface (bird densities are lower at higher altitudes due to the skewed nature of bird flight height distribution (Johnston *et al.,* 2014) and

(iv) operational period.

5.6 Changes (i.e. alternatives) to any other element of the MDS would have no bearing on collision risk for kittiwake and cannot be alternative solutions.

5.7 The Applicant has committed to further mitigation across a number of potential impacts of the Hornsea Three MDS, as summarised in Part 1, Section 7 above and detailed in Appendix 4 to Applicant's Response. The residual effects for the relevant features of the relevant European sites is as follows:

Table 5.2: Residual Impact on relevant European sites and Features

European Site	Reduction	Residual Impact
NNSSR SAC	Volume of cable protection reduced by 78,960 m^2 (40%)	No more than **0.01%** of the Annex I Sandbanks feature.
WNNC SAC	Volume of cable protection reduced by 18,840 m^2 (41%)	No more **0.0026%** of the Annex I Sandbanks feature[46].

[46] With respect to the sub-features of the Annex I Sandbanks feature, the proportions are similarly small: no more than 0.0048% of the Subtidal Sand affected, no more than 0.077% of the Subtidal Coarse Sediment affected and no more than 0.0036% if the Subtidal Mixed Sediment.

European Site	Reduction	Residual Impact
FFC SPA	**6.93m** increase to lower blade tip height (from 33.17 to 40m) will have **40.9 %, 41.4%** and **59.4%** reduction in collision risk using the Applicant's, ExA's and NE's assumed parameters, respectively. **23%** reduction in the maximum number of turbines (300 to **231).** **2%** reduction in the rotor swept area from 9.0 km^2 to **8.8 km^2**	Annual collision rate now reduced to a maximum of: 4 collisions/annum alone, using the Applicant's parameters (**0.01% of breeding population**). 7-9 collisions/annum alone, using the ExA parameters (**0.017% of breeding pop**); and 65-73 collisions/annum alone, using the Applicant's interpretation of Natural England's CRM parameters (**0.14% of breeding population**).

6. STEP 3: Alternatives that can be Discounted Immediately

"Do Nothing"

6.1 In the context of Hornsea Three, the "do nothing" option would comprise either: (i) not proceeding with the project at all (removes any possibility of harm to both kittiwake and sandbanks) or (ii) in the case of sandbanks only, excluding all cable protection from the MDS for Hornsea Three.

No Project Scenario

6.2 This can be immediately discounted as it would not meet any of the core project objectives for Hornsea Three and would (at best) ignore and (at worst) hinder efforts to respond the clear and urgent need for offshore wind deployment at scale, before 2030, to help the UK to meet its legally binding net zero by 2050 commitment to mitigate the effects of climate change.

6.3 To do nothing is not a realistic option unless one ignores a raft of Government policy: NPS EN-1 and EN-3, the "net zero" target, the UK's Clean Growth Strategy, and the UK government's commitment to deliver 40GW of offshore wind by 2030, up from the 30GW target originally set out in the Offshore Wind Sector Deal. There is an imperative need for renewable energy schemes and for offshore wind in particular; a need which is beyond argument and grows more urgent with each passing month (see Annex C: Statement of Need for Hornsea Three).

6.4 The Applicant notes that the RSPB agree that the need to tackle pressing climate change is such that a "do nothing" approach is inappropriate[47]. However, RSPB suggest that other potential future offshore wind projects mean Hornsea Three is not required. This 'wait and see' approach is not compatible with a climate emergency. The suggestion that other (yet to be identified) projects could make up for the loss of Hornsea Three fundamentally misunderstands the scale of the task in hand and the long lead-time for offshore wind development.

[47] REP10-056b, at Paragraph 36.

6.5 If Hornsea Three is not approved, a project with the scope to provide a capacity of at least 2.4GW before 2030 would be lost. Hornsea Three's contribution represents over 30% of the capacity of offshore wind farm projects pre-examination, examination and in determination (8GW), and is over 50% of the 4.5GW of offshore wind capacity currently being determined by the Secretary of State.

6.6 The scale of the targets for offshore wind (40GW by 2030 – a quadrupling of the UK's current installed offshore wind capacity), the short timescales for delivery (less than 10 years) and prevalence of offshore environmental and technical constraints, mean that lost capacity cannot be offset or replaced by other offshore wind projects that are planned and may (or may not) come forward in time or in sufficient scale.

6.7 TCE has calculated indicative time-frames for offshore wind based on its experience of previous offshore wind leasing rounds as shown on Figure 6.1 below[48].

Figure 6.1: Time to deliver new projects

6.8 This underlines the fundamental importance of optimising the capacity of *existing* areas of sea-bed or Zones (e.g. former Hornsea Zone) already identified and leased for offshore wind development as part of Round 3 and consenting offshore wind farms in the system, which are deliverable by 2030, urgently.

6.9 TCE's Round 4 offshore wind leasing round is designed to deliver between 7 and 8.5GW (maximum) of additional capacity projects, subject to a plan level HRA that has yet to be carried out and may affect the shape, scale and timing of development. The maximum individual project size is set at 1.5GW so no individual project progressed via Round 4 will make the same contribution as Hornsea Three.

[48] The Crown Estate (2019). Offshore wind operational report, January – December 2018.

6.10 With rights due to be awarded by TCE in 2021, applying typical development timescales, these projects are unlikely to be generating power on any scale before 2030 (early-mover projects would likely only move into construction in 2029 following securing a DCO). These projects would not therefore meet core project objective **ID3** (generating power within 2020s) and would not address the need to deliver 40GW of offshore wind by 2030.

6.11 It is possible that the seven extension projects identified in TCE's Extensions leasing round could be constructed and in operation by 2030, but that would require accelerated delivery timetables ahead of average historic timescales for offshore wind (see Figure 6.1 above) and would depend on consents being in place to allow participation in a CfD auction round in or around 2025/2027.

6.12 Furthermore, the total upper capacity of all seven extension projects combined is 2.85GW. It would be necessary for all seven extension projects to be delivered to their maximum anticipated capacity, within an accelerated development time-frame, to make up the lost capacity if Hornsea Three does not proceed.

6.13 That is not realistic, given offshore development attrition rates, environmental constraints (that constrain capacity), typical consenting and construction timescales (and risk of delays), and potential constraints on the capacity that can come forward in any given CfD auction round. Moreover, the purpose of the extensions projects is to provide additional capacity, not make up a "capacity gap" created by abandoning or refusing consent for Round 3 projects such as Hornsea Three.

6.14 The seven extension projects and the projects that come out of the TCE's Round 4 offshore wind leasing round, even if they could come forward within the timeframe, will also have to be subject to environmental impact assessment and HRA owing to likely connectivity with European sites.

6.15 To conclude, reliance on announced future offshore wind leasing rounds (or further rounds) can be immediately discounted as it would not meet core project objectives **ID 3, 4, 5 and 6**, and would not respond to scale and urgent nature of the identified need. Moreover, the urgent need to mitigate climate change and consequent demand for deployment of offshore wind, at scale, by 2030, means that a "do nothing" (or a 'wait and see') approach is not an option. The only questions are where and how much.

6.16 This conclusion is consistent with DEFRA 2012, which acknowledges that the "do-nothing" option is normally not an alternative solution as it would not, as here, deliver the objective of the proposal[49], and the precedent set by the Able Marine Energy Park decision (see Annex A Case Law, Guidance and Previous Decisions on Alternative Solutions).

No Cable Protection

6.17 This would fail to meet project objective **ID 11** (delivery in a safe and efficient manner) and in any event can be discounted on grounds of feasibility (technical grounds).

[49] DEFRA guidance, at paragraph 17. See further in Annex A to this document (*Case Law, Guidance and Previous Decisions on Alternative Solutions*).

6.18 The Applicant has commissioned several geophysical and geotechnical site investigation campaigns and have developed a good understanding of relevant ground conditions within the SACs (REP6-026 and Appendix 4, Annex C to Applicant's Response). However, during initial trenching there are several factors outside the Applicant's control, which can lead to reduced burial (and consequently the need for cable protection) such as:

- Adverse weather conditions;
- Mechanical breakdown of the cable burial tool; and
- Unforeseen soil conditions.

6.19 Although the Applicant disagrees with the extent of its concerns, Natural England has also identified its experience of cable burial difficulties for other offshore wind farms, and the unexpected need for additional cable protection, as a basis for their concerns regarding cabling within this area as raised in their examination submissions (e.g. REP3-076 and RR-047).

6.20 For these and other reasons, cable burial cannot be guaranteed across 100% of the export cable corridor and the precise locations where cable burial may not succeed cannot be definitively determined ahead of construction. Therefore, it is essential to provide for a degree of cable protection, including within each SAC.

Reduce or manage electricity demand (as an alternative to increasing generation)

6.21 This option would not meet any of the core project objectives for Hornsea Three and is complementary (not an alternative to) the need served by Hornsea Three (to deliver offshore wind deployment at scale by 2030). Furthermore, electricity demand is expected to increase significantly as other sectors, including heat and transport, decarbonise.

6.22 The Statement of Need (Chapter 4 in Annex C) sets out the basis for this. For example:

- Demand for electricity is likely to increase as significant sectors of energy demand (e.g. industry, heating and transport) switch from fossil fuels to electricity. The electrification of demand could mean that total electricity consumption could double by 2050.
- The long-term aim to diversify to low- or zero- carbon homes etc., would also increase demands on the NETS. Moreover, projections that UK should be building at least 200,000 new homes a year imply a potential additional increase in electricity demand by up to 24 TWh per year by 2050. Given these factors, it will be very difficult, if not impossible, for GB to meet its electricity needs into the medium and long-term without the significant capacities of new low-carbon generation.
- National Grid conclude that GB installed electrical generation needs to increase from the ~110 GW level today to between 130 and 160GW by 2030 to meet demand then, this being a 35 to 55GW increase on existing generation capacity following decommissioning of around 8GW of nuclear and 8GW of coal generation before that date.
- Energy demand management could play a role in the future of the energy balance of the UK on its own will be unlikely to deliver a decarbonised energy system.

6.23 In summary, because electricity can be generated from low-carbon technologies, the demand for electricity in GB will grow rather than reduce, as electricity contributes to the decarbonisation of other sectors. The need for significant growth in new renewable generation assets is clear. This is reflected in the increased 40GW, 2030 target for offshore wind.

Alternative Energy Generation Technologies

6.24 This option would similarly not meet any of the core project objectives for Hornsea Three and is complementary (not an alternative to) the clear and urgent need for offshore wind deployment at scale by 2030.

6.25 RSPB argue that it is the "*ends*" that the project seeks to achieve (which RSPB say is low carbon electricity) and not the means (offshore wind) that is relevant as contended by the Applicant, in line with DEFRA 2012. RSPB's "abstract" approach is at odds with case law and the guidance in DEFRA 2012 (see Annex A: *Case Law, Guidance and Previous Decisions on Alternative Solutions*).

6.26 DEFRA 2012 advises[50] with regard to the specific example of an offshore wind farm (second bullet, our emphasis added) that:

> *"In considering alternative solutions to an offshore wind renewable energy development the competent authority would normally only need consider alternative offshore wind renewable energy developments. Alternative forms of energy generation (e.g. building a nuclear power station instead) are not alternative solutions to the project as they are beyond the scope of its objective."*

6.27 The Applicant considers that the above advice is both correct and not fundamentally at odds with MN 2000 as RSPB argue. The approach advocated by DEFRA of looking at objectives in the context of a particular project (not in the abstract) has been endorsed in *Spurrier* (see Annex A to this document).

6.28 Even on RSPB's abstract approach, conventional forms of energy generation (coal and gas) cannot be alternatives as they do not contribute to RSPB's identified "aim" of low carbon electricity.

6.29 In line with DEFRA 2012 guidance[51], it is lawful and reasonable in the context of an offshore wind project to limit consideration to the potential for alternative offshore wind developments and other forms of generation are not alternatives. In any event, for the reasons set out in the Statement of Need (Annex C to this document) the availability and need for other low carbon generation does not remove the need for significant contribution from offshore wind for a number of reasons.

[50] DEFRA guidance, at paragraph 13.
[51] DEFRA guidance, at paragraph 13.

6.30 **Nuclear** – Nuclear would not meet any of the project objectives for Hornsea Three, including in particular objective ID 3 (timing). The long lead times and significant public / private funding complexities of nuclear projects, coupled with the inevitable decommissioning of the existing fleet, leads to the conclusion that nuclear power might not be as strong a contributor to low carbon generation in GB over the critical pre-2035 timeframe, as it has been to date. This analysis is illustrated in Figure 3.4 of the Statement of Need (reproduced in Figure 6.1 below), which shows a gap between projections made in 2016 and projections made today. This is highly relevant to Hornsea Three because of the importance of bringing forward significant capacities of deliverable low carbon power with urgency. It is noted that the RSPB similarly discount nuclear as an alternative to offshore wind.[52]

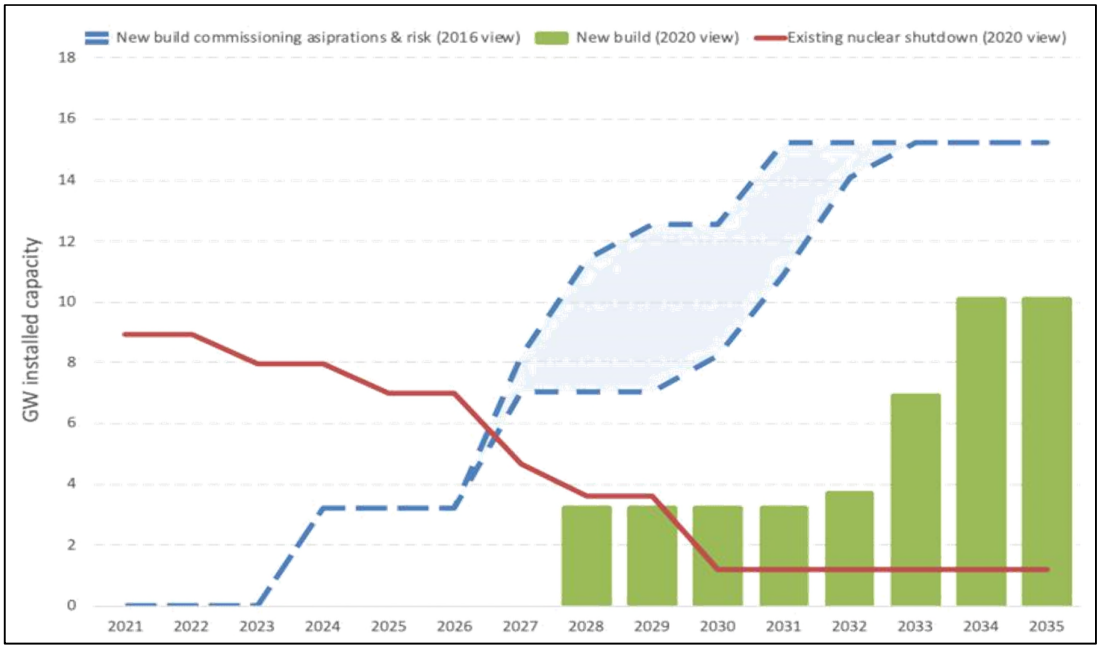

Figure 6.1: Projections of nuclear new Build capacity and existing station closures.

[52] REP10-056b, at paragraph 43.

6.31 **Other forms of offshore renewable energy** – These would not meet the objectives of Hornsea Three but are also not alternatives to Hornsea Three for the reasons explored in Chapter 3 of the Statement of Need (Annex C to this document). At present, only offshore wind can deliver new large scale, low-cost renewable generation within required time-frames. There are no recent, current or planned large-scale offshore leasing rounds for other renewable energy technologies (wave or tidal). There is no good prospect of delivery of sufficient commercial scale and viable wave and tidal projects within required timeframes. Even assuming the UK Government were to alter its stance on new onshore wind development in England and Wales, and taking into account onshore wind in Scotland, technology, locational, environmental and planning constraints are such that solar and/or onshore wind farms cannot be developed at a comparably large-scale and in sufficient number as would be needed to deliver the required capacity by 2030, in the absence of further significant contributions from offshore wind.

6.32 In any event, the UK Government has determined that it is necessary for the energy mix to include significant volumes of offshore wind (irrespective of any other forms of renewable generation that may be developed). This is evident from NPS EN-1 and EN-3, the latter stating that offshore wind is expected to provide a "*significant proportion of the UK's renewable energy generating capacity up to 2020 and towards 2050*"[53], and more recently the UK's Clean Growth Strategy, Offshore Wind Sector Deal and in the supplementary documents to the Queen's speech in December 2019[54], which states that the Government will increase their ambition from 30GW to 40GW of offshore wind capacity by 2030.

Array Locations outside the UK

6.33 Alternative sites for offshore wind farms outside the UK would not meet any of the core project objectives for Hornsea Three and would provide no contribution to the identified UK need.

6.34 Although the UK is party to international treaties and conventions in relation to climate change and renewable energy, according to the principle of subsidiarity and its legally binding commitments under those treaties and conventions, the UK has its own specific legal obligations and targets in relation to carbon emission reductions and renewable energy generation. Other international and EU countries similarly have their own (different) binding targets.

6.35 As such, sites outside the UK cannot count towards the need identified by UK policy. Conversely, sites 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.

6.36 It is therefore self-evident that locations outside the UK cannot be an alternative solution to Hornsea Three.

[53] NPS EN-3, at paragraph 2.6.1.
[54] Prime Minister's Office (December 2019). The Queen's Speech 2019: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853886/Queen_s_Speech_December_2019_-_background_briefing_notes.pdf

Array Locations outside former Hornsea Zone

6.37 Offshore wind development(s) located outside the former Hornsea Zone can be discounted on one or more of the following grounds:

- such development would not meet core project objectives ID 1, 3, 4, 5 and 6,
- such development is not feasible (for the Applicant),
- such development is complimentary (not an alternative) to Hornsea Three given the scale and urgency of the need,
- such development would or is likely to have similar adverse effects on European site(s)(e.g. cable protection within designated sites),
- even if it is assumed that such development could have lesser effects on European site(s), the strength and urgency of the IROPI case demands implementation of Hornsea Three in addition to or in preference.

6.38 TCE own and/or hold the exclusive rights to manage the leasing of seabed for offshore wind development within UK territorial waters and the UK Exclusive Economic Zone (**EEZ**), with seabed made available for offshore wind development selectively, in successive offshore leasing rounds, usually several years apart.

6.39 Locations outside the former Hornsea Zone cannot be alternative solutions for the following reasons:

- Locations identified by TCE in prior leasing rounds (Rounds 1, 2, 2.5, 3) are already under exclusivity to other offshore wind developers and subject to offshore wind developments which are operational, in construction or consented. Those locations are not legally available to the Applicant but in any event form part of the existing "baseline" of projects. The need case is predicated on delivery of additional capacity, so existing projects cannot be alternatives.
- The identification of the former Hornsea Zone (and other Round 3 Zones) was the output of a robust Government and TCE spatial planning process involving SEA to identify / indicate relative levels of constraint and opportunity, and an AA by TCE of its plan to award the 9 ZDAs. The former Hornsea Zone, within which Hornsea Three is located, was identified through this process along with other Round 3 Zones. Against the background of the need for a massive amount of additional capacity, it is inherent to a spatial approach which seeks to identify multiple Zones, each of which is expected to deliver multiple projects up to a set Zone-level target, that neither the Zones, nor the projects within the Zones, can be reasonably treated as alternatives to one another, otherwise the overall target will not be delivered as there is inevitably always an alternative within another Zone.
- The location and boundaries of the former Hornsea Zone were determined by TCE and are beyond the control of the Applicant. Locations outside the former Hornsea Zone would not meet core objectives ID 4, 5 and 6, and are not available to the Applicant. The location of Hornsea Three within the former Hornsea Zone is as far from FFC SPA as it is possible to be within the UK without straying into another Member State's jurisdiction.

- At present, the only alternative locations that are potentially available are locations within the bidding areas identified by TCE for Leasing Round 4. As set out above, Leasing Round 4 projects are very unlikely to be generating power on any scale before 2030. These projects would not meet core project objective ID 3 (generating power from Q4 2025/ Q4 2026) and would not address the need the Government's ambition to deliver 40GW by 2030.
- As noted previously, the total upper capacity of all seven extensions projects combined is 2.85GW. None of those locations individually deliver the capacity that can be delivered by Hornsea Three. Furthermore, all 7 projects would need to be developed to their maximum potential and come forward in parallel, to deliver the same benefit as Hornsea Three. Given offshore development attrition rates, constraints, technical challenges and consenting delays, that is considered improbable and not a credible alternative (and all will be subject to their own environmental impact assessment and HRA).
- Given the number and spread of European sites around the UK and the mobile nature of many of the qualifying species, any comparable large-scale offshore wind proposal located in the North Sea is highly likely to give rise to similar types of impacts either on FFC SPA (in-combination) or for other SPAs and SACs (e.g. cable protection). This is illustrated through the constraint mapping and regional characterisation reports published in connection with Leasing Round 4[55]. In other words, the notion that unidentified and unconstrained areas exist to deliver the scale of development required, without effects on the integrity of European sites is improbable.

Alternative Array Locations within former Hornsea Zone

6.40 As discussed in section 4.6 of Volume 1, Chapter 4: Site Selection and consideration of alternatives of the ES, TCE initially established a target capacity of 4GW of generating capacity, to be met through the development of multiple offshore wind farm sites within the former Hornsea Zone. That target has not been met.

6.41 The identification of project sites within the former Hornsea Zone was carried out using the process of Zone Appraisal and Planning as recommended by TCE specifically for Leasing Round 3 and endorsed within NPS EN-3. This process was designed to identify areas of least constraint and greatest opportunity. Details in relation to identification of the areas for the Hornsea projects (One, Two and Three) are provided in section 4.6 of Volume 1, Chapter 4: Site Selection and consideration of alternatives of the ES.

6.42 Hornsea Projects One and Two, in the central part of the former Hornsea Zone, were pursued first and have been consented on the basis there would be no AEOI alone or in combination, and are no longer available. The targets for offshore wind have increased, not reduced since the consenting of these projects, and so their existence does not lessen the scale or urgency of the need for further large-scale offshore wind projects, either in general terms or within the former Hornsea Zone.

[55] Characterisation Area Reports (Bidding Area): https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/offshore-wind-leasing-round-4/round-4-document-library/

6.43 As set out in paragraph 4.6.1.8 of Volume 1, Chapter 4: Site Selection and consideration of alternatives of the ES, prior to selecting the Hornsea Three array area, the Applicant carefully assessed the remaining available seabed within the former Hornsea Zone. On the information available at that time, the Hornsea Three site was preferred based on constraint and technical analysis, in the context of the project objectives (specifically core project objectives **ID 5, 6 and 7**).

6.44 Furthermore, given the foraging range of a number of the qualifying species of FFC SPA, all possible locations for commercial scale offshore wind farms within the former Hornsea Zone have connectivity with one or more species from the FFC SPA and are in a similar position (to greater or lesser degrees) with regard to potential impacts on qualifying species of FFC SPA, adding to existing in-combination impacts. There is no location within the former Hornsea Zone that could be developed without impacts on species from FFC SPA.

Export Cable Corridor Route Wholly Avoiding NNSSR SAC

6.45 The routing of the export cable corridor follows on from and is constrained by the location of the array area (addressed above). Details relating to the Applicant's selection of the Hornsea Three landfall location (in light of the array location) and routing of the offshore cable corridor between those fixed points can be found in the following documents.

- Volume 1, Chapter 4: Site Selection and Consideration of Alternatives of the Environmental Statement (APP-059)
- Volume 4, Annex 4.1 - Grid Connection and Refinement of the Cable Landfall of the Environmental Statement (APP-092)
- Volume 4, Annex 4.2 - Selection and Refinement of the Offshore ECR and HVAC Booster Station of the Environmental Statement (APP-093).

6.46 For technical and cost reasons, offshore cable routing is a minimisation exercise to find the shortest and straightest feasible route from point A (offshore array area) to point B (landfall site), subject to avoiding hard constraints dictated by engineering limitations, physical obstructions, third party assets (e.g. cable crossings), competing seabed use (e.g. Ministry of Defence testing ranges, aggregates extraction, CCS, other offshore renewables developments) and where feasible, environmental constraints (i.e. designated sites).

6.47 Avoiding or minimising the intersection of the export cable corridor with designated sites (European sites and MCZ) was a key design objective for Hornsea Three. However, the number, location and spread of designated sites between the Hornsea Three array area and the UK shoreline made complete avoidance of all designated sites impractical. The weight applied by the Applicant is evident in the cable re-route which occurred post S42 consultation / pre-submission (Refer to STEP 4C- Consideration of Feasible Alternatives for NNSSR SAC).

6.48 Figure 3.1 of the RIAA (**APP-051**) illustrates the location of the Hornsea Three array relative to European sites. When Figure 4.6 of Volume 1, Chapter 4: is considered alongside Figure 3.1 of the RIAA, the significant constraining factors (legal, technical and financial) are readily apparent. All feasible export cable routes to shore intersect with one designated site or another (or more than one designated site) to various extents. Avoiding or reducing impacts on one designated site increases the impact for others.

6.49 With regard to NNSSR SAC, it extends from approximately 40 km off the north Norfolk coast out to approximately 110 km offshore and encompasses the most extensive area of offshore linear ridge sandbanks in the UK.

6.50 Given the position and lateral extent of the NNSSR SAC relative to the fixed positions of the Hornsea Three array area and the landfall area, it is immediately apparent that avoiding the SAC completely is no more than a theoretical possibility and can be immediately discounted.

7. STEP 4: Identification of any Feasible Alternatives

Introduction and Essential Context

7.1 As a starting point, the scale and urgency of the need for offshore wind necessitates solutions that deliver more rather than less capacity. Furthermore, constraining projects within previously identified Zones/ sites unnecessarily is undesirable as it results in sub-optimal and inefficient use of seabed within those Zones/ sites previously identified as being least constrained. If the least-constrained sites are used sub-optimally, more and more projects need to be delivered within increasingly more constrained sites in more challenging locations.

7.2 From that starting point, determining the viable scale of an offshore wind project must be considered in the context of the specific characteristics of the individual project and the highly competitive commercial framework within which the project is being delivered, set against the scale of the need. It is not possible to set an envelope that only responds to environmental impacts and consent implications. Key factors which will influence the design envelope promoted for a project are:

- distance from the grid connection point;
- project generation capacity (MW size) and commercial expectations prescribed by funding mechanisms (such as CfD);
- construction costs of array, transmission and grid connection;
- technology availability, cost and reliability;
- health and safety considerations during construction, operations and decommissioning;
- local (UK) content supply chain objectives and supply chain capacity; and
- project execution schedule.

7.3 These project specific considerations must be considered within the context of the UK government's policy objective, to support the development of a domestic offshore wind industry, which delivers large scale, low cost renewable generation. To date, the cost of offshore wind has fallen dramatically, and future projects will need to continue to be cost competitive. The ability for developers to select the optimal project design, including transmission technology, is essential to project viability and deliverability.

7.4 Stable policies and a steady pipeline of projects has provided developers and wider supply chain with the confidence to make significant investments. This has driven down the cost of offshore wind through scale, innovation and industrialisation, with projects securing record low prices at £39.65/MWh, in the latest CfD auction in 2019. Part of the observed reduction in LCoE can be attributed to continued optimisation of offshore transmission technologies, and HVAC transmission technology specifically.

Step 4A - Consideration of Feasible Alternatives for FFC SPA

7.5 The potential options considered at this stage have included:

- number of turbines,
- maximum rotor swept area,
- height of turbine blades above sea surface and
- constraints on operational period (e.g. turbine shut-down during breeding periods).

7.6 The Hornsea Three array location has been considered earlier and other changes (i.e. alternatives) to any other element of the MDS would have no bearing on collision risk for kittiwake and cannot be alternative solutions.

7.7 As set out in the Mitigation and Project Envelope Modification Note (Appendix 4 to Applicant's Response), the Applicant has continued to vigorously re-appraise all elements of the MDS for Hornsea Three, to ensure that all feasible mitigation has been deployed. Additional mitigation commitments for Hornsea Three have been made as part of the reduced MDS, and improvements in technological innovation, such as larger turbines and blade developments, which have developed since Application submission and Examination.

7.8 This has resulted in a reduction in the number of WTGs from 300 to 231, reduction in the rotor swept area from 9km^2 to 8.8km^2 (see Table 5.2 above) and increasing the lower blade tip height to 40m MSL / 41.8m LAT.

7.9 In exploring all feasible mitigation, it is not feasible to further reduce these key parameters. Any imposition on Hornsea Three's ability to generate throughout the year (i.e. by way of seasonal operational restrictions) would jeopardise the viability of the project. It is not a feasible alternative on that ground alone. In addition, the imposition of temporary operational shutdowns of turbines can only realistically be considered for species with a distinct and well-established migratory behaviour which occurs over a brief period of time. Cleasby et al (2018) indicates that Hornsea Three does not appear to represent an important area for kittiwake from the FFC SPA during the breeding season. Thus, there is no distinct season to implement a temporary shutdown for kittiwake and no single period correlates to a focused period of activity by kittiwake across the array (Refer to the Applicant's Ornithological Comparison Data (July 2019). Kittiwake are present in only low numbers year-round in the Hornsea Three site. So there is no evidence to suggest that a temporary shutdown would have any effect other than lost electricity production from Hornsea Three and to the British consumer. With GB electricity demand projected to grow 5% by 2030 and increasing to 30 and 50% by 2050 (Annex C to this document) it is clear that all power generating plant needs to be delivering at its optimal level.

7.10 For these reasons this is not a feasible alternative and it would not meet objectives 1, 2, 6 and 7.

7.11 Any such further envelope restrictions or operating restrictions would not meet core project objectives for Hornsea Three (Table 4.3) and are not considered feasible, in particular:-

- Prohibit further decrease in generation cost per MW than those made possible by earlier projects by providing a project that can take advantage of economies of scale (in context of the greater distance to grid connection and greater distance required to onshore operational and maintenance facilities).

- Materially limit the opportunity for the project to continues to decrease the LCoE over that established in recent CfD auction round and therefore limit the Applicant's ability to be able to put forward a competitive proposition in a future CfD auction rounds.
- Suboptimal selection of blades.
- Increased risk of a suboptimal array layout or use of supporting offshore infrastructure, inefficient use of export cable capacity and grid connection capacity.

7.12 Further reduction in the project envelope would also have a corresponding reduction in the generation capacity of Hornsea Three, reducing the positive impact Hornsea Three will otherwise have in terms of responding to the need for low carbon energy (as established in the NPSs), helping the UK meet its legally binding net zero commitment, helping realise the UK Government's ambition of 40GW of offshore wind capacity by 2030 and deliver a cost-effective solution, while maximising the benefits to the UK.

7.13 When considering further mitigation to reduce impacts on collision risk to seabirds, the Applicant has therefore focussed on raising the height of the turbine blades above the sea surface and therefore moving the rotor swept area to altitudes where bird densities are lower due to the skewed nature of bird flight height distribution (Johnston et al., 2014). Collision risk modelling (CRM) indicates that this is an effective way of reducing the collision risk (refer to Annex B of Appendix 4 to Applicant's Response).

7.14 With regards to the ability for the project to make any further heights above 40m MSL / 41.8m LAT, the supply chain needed to support higher lift heights associated with larger structures (foundations and towers) does not currently exist. The Applicant is not aware of any existing tower suppliers or wind turbine installation vessels which have the capability to lift blades to heights greater than 40 m MSL on turbines with hub heights above 150 meters. To be able to achieve these higher heights, the supply chain needs to be developed further.

7.15 Notwithstanding material steel and design implications associated with any further increases beyond 40 m MSL, the Applicant has no confidence that installation vessels capable of such extents, operating safely within their design capabilities, could be available within the timeframes proposed for Hornsea Three.

7.16 To further restrict the turbine envelope would result in a consent building envelope that is not feasible. Further it would be unable to be delivered within the stated timeline, in accordance with the wider project development strategy or comply with wider regulatory frameworks and commercial objectives required to deliver a project in the competitive pricing established through the CfD process.

Step 4B - Consideration of Feasible Alternatives for NNSSR SAC and WNNC SAC

Commit to HVDC and exclude HVAC (to recued no. of export cables)

7.17 Hornsea Three seeks the option to use High Voltage Alternating Current (HVAC) or High Voltage Direct Current (HVDC) transmission, or a combination of both technologies in separate electrical systems[56]. Of those options, HVDC technology would involve fewer cables as the maximum number of HVAC cable circuits is six, and the maximum number of HVDC cables is four. Each worst case assessment (as they extend to the export cables) could be scaled by a factor of 2/3rds based on the reduced maximum number of HVDC cable circuits and would therefore give rise to less impact).

7.18 The Applicant's position in respect of the need to include both the HVAC and the HVDC transmission system options is set out in Appendix 22 of the Applicant's Deadline 2 submission (Transmission System (HVAC/HVDC) Briefing Note (**REP1-164**)) and was also addressed in the Applicant's oral case put at Issue Specific Hearing 1 (see written summary in **REP3-003**).

7.19 In summary, the Applicant has given detailed and careful consideration to the feasibility of the alternative of committing to using HVDC technology. In short, maintaining the option to use HVAC technology is considered essential to ensure deliverability of Hornsea Three in a competitive market and a low cost of energy to the UK consumer (i.e. in order to meet project objectives ID 2 and ID9).

7.20 **REP1-164** sets out the Applicant's justification for the inclusion of both transmission technologies. Amongst other matters, it notes at present, all UK offshore wind farms operating or in construction (at the time of examination) utilise an HVAC transmission technology. There are no comparable examples of operational UK offshore wind farms using HVDC technology and the first projects – Dogger Bank have only very recently (Q1 2020) moved into construction with the technology remaining to be delivered, tested or successfully operational. Whilst the advancement of the HVDC technology by the Dogger Bank projects is welcome, the Applicant retains the view that committing solely to HVDC in the consented envelope of Hornsea Three would (at best) restrict, or (at worst), could prevent the development of Hornsea Three in the future. Thus, excluding the option of an HVAC transmission system cannot be made at this time.

Further Reduce Volume of Cable Protection with SAC

7.21 The Applicant has gone further than normal and presented a Preliminary Trenching Assessment during Examination (**REP6-026**). This presents an initial ground model for the Hornsea Three offshore cable corridor within designated sites, drawing on the Applicant's detailed knowledge of the site conditions and target burial depths, and an assessment of tool viability for the ground conditions recorded. The Preliminary Trenching Assessment provides additional confidence on the ability to bury export cables within marine protected areas.

[56] If a combination of the two technologies is used, the total infrastructure installed will not exceed the maximum values assessed within this application.

7.22 Further, the applicant has investigated the potential for remedial burial to be used within the parts of the offshore cable corridor which coincide with the WNNC and NNSSR SACs, as an alternative to cable protection, based on the ground conditions present across the offshore cable corridor. The results of these investigations are presented in Annex C of Appendix 4 to the Applicant's Response and have resulted in the project design envelope reductions set out in Table 7.2 and Table 7.3.

7.23 The Applicant does not consider it technically feasible to further reduce the MDS for cable protection. Ultimately, the need for secondary cable protection (i.e. rock protection) is required for asset integrity. This applies both along the export cable at and at all asset crossing points – where it is vital that the integrity of both the established and new assets are suitably protected. Leaving cables unburied, as set out in REP1-138, is not a viable alternative to the protection of the asset, or protection of marine users.

Alternative Forms of Cable Protection

7.24 The use of concrete mattresses and grout bags were discounted by the Applicant as they represent a much larger change to the baseline environment and would lead to a greater impact than that identified with the use of appropriately sized rock protection (REP1-138). Moreover, there are concerns as to their effectiveness at providing adequate protection for the cable over the life of the project. The shallow and energetic hydrodynamic character of the Southern North Sea subjects forces on mattresses which can undermine their structural integrity over time, reducing their effectiveness as cable protection and presenting significant challenges for the safe removal and replacement of degraded mattresses. Although the installation of concrete mattresses is relatively straightforward their maintenance and replacement can be more hazardous, often requiring diver support, and introducing unacceptable health and safety risks to operations.

7.25 Fronded mattresses are a type of concrete mattress affixed with polypropylene strands to the top side of the mattress. Whilst Frond mattresses can be deployed in some areas, the use of Frond mattresses were discounted by the Applicant as they represent a larger change to the baseline environment than appropriately sized rock protection and there are concerns as to their effectiveness at providing adequate protection for the cable over the operational life of the project, as described in the preceding paragraph. In addition to degradation, concrete and fronded mattresses have been known to slump into the seabed and drape over the cable exerting pressure on, and causing potential damage to it. Due to the risk of plastic pollution and release of plastic fronds into the water from mattress degradation, the MMO recently advised the Hornsea Two project of their preference against the use of fronded mattresses, and this resonates with the Applicant's goal to reduce the introduction of plastic into the marine environment, where possible. For these reasons, this is not a feasible alternative, and it would not result in a reduction in the impact on the integrity of the European sites. Use of concrete mattresses is not considered a feasible alternative and would not meet objectives 2, 10 and 11.

STEP 4C- Consideration of Feasible Alternatives for NNSSR SAC

Further Re-Routing of Export Cable Corridor

7.26 As set out in APP-093, at a high level, offshore cable routing is a minimisation exercise to find the shortest route from the array area to a chosen offshore cable landfall site, when considering constraints dictated by engineering limitations, physical, third party and environmental constraints and seabed use. Installation of longer deviated cable routes between the array and landfall increases the risk to cable security due to the increased likelihood of exposure to natural and manmade hazards and conflicts with other marine users. Insurance brokers and underwriters have identified that 80% of offshore wind farm claims are cable-related[57] and of these greater than 75% of cable faults are caused by human activities. This and the high cost associated with export cable procurement and installation (at circa 350,000 £/MW excluding offshore substations) drive the imperative need to develop the shortest and most direct possible cable route to connect the generation asset to land, notwithstanding consideration of technical challenges associated with cable installation, burial and physical and environmental constraints. A robust cable route engineering methodology has been adopted for Hornsea Three, which takes into consideration risk-based weighted constraints, including environmentally sensitive areas, to inform an optimised route which minimises those criteria which undermine the successful installation and burial of the cable. Criteria critical to delivery of a securely installed cable include avoiding (prioritised):

- Extremely hard ground conditions
- Slopes greater than 12° (including sandwaves > 10 m and preferably < 5 m)
- Boulder fields, or route through
- Anchorages – 2000 m separation distance
- Spoil areas – 1000 m separation distance
- Fire practice areas – 2000 m separation distance
- Dredging areas – 1000 m separation distance
- Dumping areas – 1000 m separation distance
- Localised holes – 1000 m separation distance
- Wrecks – 250 m separation distance
- Riggs – 1000 m separation distance
- Disused well heads – 500 m separation distance
- Environmental sensitive areas – 1000 m separation distance
- Navigation buoys – 500 m separation distance
- UXO – 200 m separation distance
- Archaeological Items of Interest – 200 m separation distance
- Crossings with no course deviation 500 m either side of crossing
- Alter Courses

[57] Offshore Wind Programme Board (2015). Overview of the offshore transmission cable installation process in the UK.

- 15° maximum. Stagger alter courses by 100 m if larger angles needed
- 150 m turning circle

7.27 Meeting all criteria is rarely achieved and involves an expertly informed decision-making process. Any increases in cable length not driven by known hard constraints which undermine successful cable installation (i.e., hard ground conditions, steeply variable seabed topography, dense boulder fields, offshore hazards and other licenced marine activities (e.g., aggregate extraction) will inevitably increase the likelihood of encountering those hazards and increase the risk of not delivering a secure transmission system. With respect to Hornsea Three, routing the export cable to avoid completely the NNSSR SAC would increase the export cable by 27 km (to the west) and 37 km (to the east), respectively. When put into context of the other significant number and primary constraints within this area of the SNS (APP-093), the risk to delivering a secure transmission system is evident. Thus, this is not a feasible alternative and it would not meet objectives 2, 10 and 11. The following paragraphs discuss specific constraints to each route alternative in more detail.

7.28 Volume 4, Annex 4.2 of the Environmental Statement (APP-093) outlines the process in more detail whereby the Hornsea Three offshore cable corridor was selected and refined, in light of engineering constraints, environmental sensitivities (including minimising the length of cable passing through the NNSSR SAC) and other users (e.g. oil and gas infrastructure, cables, aggregate extraction and offshore wind). As set out in APP-093, one of the main constraints to cable routing between the Hornsea Three array area and the landfall location at Weybourne was the presence of seabed features, including seabed depressions and sandbanks, with large sandbanks and seabed depressions causing significant technical constraints to cabling and therefore these are avoided, where possible, during route selection.

7.29 There are two sections of the offshore cable corridor which pass through the NNSSR SAC: the northern intersection and the southern intersection. The final offshore cable corridor was selected based on a number of conflicts in the area which are set out in Section 5 and 6 of Annex 4.2. These are considered further below.

7.30 For the northern intersection, key factors included:

- Ensuring that existing assets were crossed as close to 90 degrees as possible (this is optimal for a number of reasons including, but not limited to, limiting the area and volume of cable protection required to cross the asset);
- Avoiding paralleling cables/pipelines, ensuring separation between these (assumed to be 500 m) in order to avoid conflicts with other operators in the area (e.g. possible future maintenance operations);
- Avoiding aggregate extraction areas to the northwest and southeast of the offshore cable corridor close to the northern boundary of the NNSSR SAC, which limited the ability to route around the NNSSR SAC;
- The large number of wells (including plugged and abandoned) and subsurface structures associated with oil and gas fields to the west/northwest of the northern intersection with the NNSSR SAC (e.g. the Audrey and Tethys fields).
- Additional cabling distance circumnavigating the SAC would exacerbate challenges associated with long distance grid connections (REP1-164), and if HVAC transmission technology was utilised anticipated to add the additional need for an additional on-route HVAC Booster Station (APP-058), reducing connection efficiency and potentially leading to greater energy loss.

- Require further / close parallel export cable routing to the existing Sheringham Shoal and Dudgeon Offshore wind farms (and now subject to planned extensions) – increasing risks associated with 'Simultaneous Operations' (SIMOPS), elevating risks where two different activities occur in close proximity to each other that there is a risk of interference or cumulative damage;
- Materially add to project construction costs, construction burden with any re-routes to the north, avoiding the SAC in its entirety requiring an approximate offshore route in order of 190km (25-30km longer distance per cable), with any re-routes to the south requiring an approximate offshore route in order of 200km (35-40km longer distance per cable). This associated additional distance then places further risk on the asset (increasing risk of faults or damage) and would increase, proportionately the extent of cable protection required.

7.31 The routing of the northern intersection with the NNSSR SAC was therefore concluded to be the best possible routing of the offshore cable corridor which balanced the constraints posed by existing assets with the need to minimise overlap with the NNSSR SAC. If further re-routes are not considered technically feasible, owing to materially increased risk profile due to the increased interface with other infrastructure and activities (not lease at aggregate extraction).

Southern Intersection

7.32 The southern intersection showed similar constraints although with potentially greater engineering limitations related to ground conditions. Key factors influencing the southern intersection routing through the SAC (rather than around) included:

- Presence of oil and gas infrastructure, including pipelines, wells and subsurface structures (e.g. associated with the Clipper field) to the west of the offshore cable corridor;
- Presence of cables within and adjacent to the NNSSR SAC and the need to avoid paralleling these as much as practical; and
- Presence of the Haddock Bank sandbank to the west of the southern intersection: while located outside the boundary of the NNSSR SAC, this is a very large sandbank feature which would have represented a significant constraint to cable installation, with the potential dredging of considerable volumes of material.
- Avoidance of deeper water and trenches.

7.33 The southern intersection was therefore concluded to be the best possible route when balancing constraints posed by existing assets, while also ensuring that the cables can be successfully installed. While the southern intersection passes through sandbank features within the NNSSR SAC (i.e. the Leman and Ower Banks), the offshore cable corridor passes through the edges of these features which will have a reduced impact and be acceptable from an engineering perspective (particularly compared to the Haddock Bank outside the SAC due to reduced heights and slopes of the sandbanks - not representing a significant constraint to cable installation. Further re-routes are not considered technically feasible owing to materially increased risk profile due to the increased interface with other infrastructure and activities (not lease at aggregate extraction).

STEP 4D – Consideration of Feasible Alternatives for WNNC SAC

Further Re-Routing of Export Cable Corridor

7.34 It was not practical to entirely avoid both the Cromer Shoal Chalk Beds MCZ and the WNNC SAC and for the offshore cable corridor to make landfall at Weybourne (which is located at the western edge of the MCZ and immediately to the east of the boundary of the WNNC SAC).

7.35 Volume 4, Annex 4.2 of the Environmental Statement (APP-093) explains the basis for discounting alternative landfalls outside the boundary of the Cromer Shoal Chalk Beds MCZ, which were unfeasible for a range of reasons, including the requirement for a large number of pipeline crossings associated with the Bacton Gas Terminal facility and the potential for interaction with the Haisborough, Hammond and Winterton SAC.

7.36 The Applicant initially considered an alternative offshore cable corridor which, though it avoided interactions the WNNC SAC, required extensive routing of the offshore cable corridor through more sensitive habitat within the Cromer Shoal Chalk Beds MCZ. This alternative was the subject of statutory consultation during the pre-application stage and was deemed not acceptable due to the likely irreparable damage to protected features of the MCZ (i.e. peat and clay exposures) and greater volumes of cable protection (primarily associated with asset crossings) which would be placed within the Cromer Shoal Chalk Beds MCZ. As such, this alternative was understood by the Applicant to be unacceptable to NE and the MMO. As such, an alternative route is not considered feasible (i.e. it would have unacceptable environmental impacts).

7.37 In conclusion, given the array and landfall locations, the Hornsea Three offshore cable corridor, as amended following Section 42 consultation, represents the best possible balance, routing through an area of lesser sensitivity within the WNNC SAC, ensuring the overlap is as short as possible, while avoiding key features of the WNNC SAC further west (e.g. other Annex I habitat features of the SAC) and (more sensitive) habitat within the MCZ.

8. STEP 5: Assessment & Comparative Analysis of Feasible Alternative Solutions

8.1 Step 5 would involve an assessment and comparative analysis of the relevant impacts of any identified feasible alternatives in respect of European sites comprised in the national site network.

8.2 As the previous Steps (1 – 4) demonstrate there are no feasible alternatives to Hornsea Project Three, to Hornsea Project Three at that location or to the final MDS for Hornsea Project Three. This Step is therefore not required.

9. Summary and Overall Conclusions

9.1 The purpose of this report has been to demonstrate objectively to the Secretary of State that there are no feasible alternative solutions to Hornsea Three.

9.2 Section 7 above summarises the iterative and comprehensive design and mitigation process including a range of potential alternatives discounted by the Applicant during pre-application and Examination prior to determining the final MDS for Hornsea Three and summarised in Table 9.1 below. This serves to underline the exhaustive design process which underpins the final MDS for Hornsea Three.

9.3 Against that background, a total of a further 18 potential alternative options have been considered and discounted for the reasons set out in Sections 7 – 9 above, as summarised in Table 9.1 below. The symbol (K) is used to denote a measure relevant to impacts on kittiwake and the symbol (S) is used to denote a measure relevant to impacts on sandbanks slightly covered by water at all times.

Table 9.1: Summary of Potential Alternative Options Discounted

Category	Alternative Option Considered	Reason Alternative Option Discounted
Do nothing	Not progressing Hornsea Three (**K & S**)	Does not meet project need and does not deliver any of the project objectives
	No cable protection (**S**)	Does not meet project objective ID 11 and is not feasible (on technical grounds)
Reduce Demand	Energy efficiency measures etc. (**K & S**)	Akin to "do nothing" - does not meet project need and does not deliver any of the project objectives
Alternative Energy Generation Technologies	Conventional power (coal, gas) (**K & S**)	Would hinder achievement of project need and does not deliver any of the project objectives
	Nuclear (**K & S**)	Does not deliver any of the project objectives
	Other renewable energy technologies (**K & S**)	Does not deliver any of the project objectives
Alternative Locations or Routes	Array located outside UK (**K**)	Does not meet project need and does not deliver any of the project objectives
	Array located outside English waters (**K**)	Does not meet project need and does not deliver any of the project objectives
	Array located outside former Hornsea Zone (**K**)	Does not meet project need and does not deliver any of the project objectives (and no evidence this would avoid impacts on European sites)
	Array located elsewhere in former Hornsea Zone (**K**)	Does not meet project objectives ID 5 and 6 and would not avoid impacts on European sites
	Export cable corridor avoiding all SACs (**S**)	Not feasible (legal, technical and financial grounds)
Other scales or designs or methods of construction	Reduce turbine numbers to less than 231 (**K**)	Would reduce contribution to need and does not meet project objectives ID 1, 2 and 7 Not feasible (financial grounds)
	Increase lower blade tip height above 40.8m LAT (**K**)	Not feasible (technical and financial grounds)
	Restrict total swept area to less than 8.8km^2 (**K**)	Not feasible (technical and financial grounds)
	Further re-routes to export cable corridor to reduce footprint within SACs (**S**)	Does not meet project objectives 10 and 11 Not feasible (legal and technical grounds)
	Alternative form of cable protection (concrete mattresses) (**S**)	Not feasible (legal and technical grounds)
	Reduce maximum footprint of cable protection within SAC (**S**)	Not feasible (legal and technical grounds)
Other Means of Operating / Timing	Turbine shut down during kittiwake breeding season) (**K**)	Would reduce contribution to need and does not meet project objectives 1, 2, 3 7 and 11 Not feasible (legal, technical and financial grounds)

9.4 The consideration of alternative solutions must be approached on a reasonable basis, with reference to the genuine project objectives designed to serve the identified need. Each stage/ step must be grounded in real world considerations of feasibility (legally, technically and commercially). With that in mind, the Applicant has undertaken a comprehensive analysis of potential alternative options which is considered sufficient to enable the Secretary of State to be objectively satisfied as to the absence of any feasible alternative solutions to Hornsea Three.

9.5 In this context it is relevant and reasonable for the Secretary of State to have regard to and place weight on the experience and expertise of the Applicant in offshore wind development. Ørsted, is a world leading offshore wind developer with an extensive and successful track record of offshore wind deployment. Ørsted has built more offshore wind farms than any other developer in the world.

9.6 Ørsted currently has approximately 6.8GW of offshore wind capacity, with offshore wind farms in the US, Taiwan and across Europe, in Denmark, Germany, the UK and The Netherlands. The UK is Ørsted's largest market, with 11 operational wind farms and another two, Hornsea Project One just entering into operation and Hornsea Project Two under construction. These 11 offshore wind farms have a combined capacity of 3.7GW and produce enough green electricity to power 3.2 million UK homes[58]. By 2022, this figure will increase to 5.5 million UK homes.

9.7 The final MDS for Hornsea Three is informed by expert judgement and market leading expertise, with current knowledge of the realities and challenges of construction in the marine environment. The Applicant believes that the vast experience Ørsted holds in offshore wind delivery globally should give the Secretary of State confidence that the Applicant has considered all feasible options to avoid or reduce harm to European sites whilst ensuring a viable and deliverable project.

[58] Based on a UK installed capacity of 3.7GW applying BEIS five-year average load factor of 38.6%, a household consumption figure of 3,828kWh per year and 27.2 million UK households.

Shadow HRA Derogation Case

Part 3: Report to Demonstrate IROPI

1. Introduction - IROPI

1.1 This Part of the Applicant's response to the Consultation is provided to demonstrate that the Secretary of State can be satisfied that there are imperative reasons of overriding public interest (**IROPI**) for Hornsea Three, if the Secretary of State concludes any AEOI in respect of any of the following features of the identified European sites:

Table 1.1: Features of the identified European Sites

European Site	Relevant Qualifying Feature	Relevant Impact from Hornsea Three
NNSSR SAC	"*sandbanks slightly covered by water at all times*"	Placement of cable protection on seabed
WNNC SAC	"*sandbanks slightly covered by water at all times*"	Placement of cable protection on seabed
FFC SPA	Kittiwake	Collision risk

2. Structure and Content

2.1 This IROPI submission is structured as follows:

2.1.1 **Section 3:** Consideration of methodology and approach to IROPI (with reference to law and guidance as appropriate).

2.1.2 **Section 4:** Presentation of the Hornsea Three IROPI case structured around the following guidance principles:

i. Imperative: demonstration of the urgency and importance of Hornsea Three.

ii. Public interest: demonstration of the public interest in the development of Hornsea Three.

iii. Long-term interest: demonstration of the long-term nature of the interests that Hornsea Three will serve.

iv. Overriding: demonstration of the public interest balance weighing in favour of Hornsea Three in the context of its impacts on the FFC SPA, the NNSSR SAC and the WNNC SAC.

2.1.3 **Section 5:** IROPI conclusion.

2.2 Also appended to this section of the Applicant's response are:

- Legal and Policy Update (Annex B to this document).
- Statement of Need for Hornsea Three prepared by Simon Gillett at New Stream Renewables (Annex C to this document).
- Case Studies (Annex D to this document):
  - Able Marine Energy Park; and
  - Little Cheyne Court Wind Farm.

3. Legislative and Policy Context for IROPI

The Scope of IROPI

3.1 The HRA Derogation Provisions provide that a project having an AEOI on a European site may proceed (subject to a positive conclusion on alternatives and provision of any necessary compensation) if the project must be carried out for reasons of IROPI.

3.2 The HRA Derogation Provisions identify certain in-principle grounds of IROPI that may be advanced in favour of said project, although these are not exhaustive and other IROPI grounds may be relied upon.

3.3 There are restrictions on IROPI grounds for impacts to priority habitat or species, unless the matter is subject to a further opinion[59]. In the case of Hornsea Three, the NNSSR and WNNC SACs do not host any priority habitat type or priority species subject to any likely significant effect as a consequence of Hornsea Three (alone or in-combination). SPAs classified under the Birds Directive do not identify priority habitat types or priority species.

3.4 Therefore, the IROPI which can be considered for Hornsea Three are unconstrained, and can include:

- The core IROPI of human health, public safety and beneficial consequences of primary importance for the environment;
- IROPI of a social or economic nature; and
- Any other IROPI.

3.5 The parameters of IROPI are explored in DEFRA 2012 and MN 2000, which identify the following principles:

- *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 (i) actions or policies aiming to protect fundamental values for citizens' life (health, safety, environment); (ii) fundamental policies for the State and the Society; or (iii) 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.

[59] Post-Brexit the requirement to seek the opinion of the EC has been removed. Where the decision-maker is the Secretary of State, there is no requirement to obtain a further opinion from another body.

- *Overriding*: The public interest of development must be greater than the public interest of conservation of the relevant European site(s).

3.6 The Hornsea Three IROPI case presented below is structured around these principles. Whilst the principles are considered separately there is necessarily some overlap between them and they should be considered as a whole.

4. Hornsea Three IROPI Case

Imperative – A clear urgency and importance

The Global Imperative

4.1 Climate change is the defining challenge of our time. The impacts of climate change are global in scope and unprecedented in human existence.

4.2 The science linking the concentration of greenhouse gas emissions to average global temperature on Earth is unequivocal. Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels to date with temperatures predicted to rise and likely to reach 1.5°C between 2030 and 2052 at the current rate[60].

4.3 The Intergovernmental Panel on Climate Change (**IPCC**) has stressed the importance of keeping global temperature increases to within 1.5°C to limit the negative consequences of climate change, which will require a system transition at an unprecedented scale, with deep emission reductions in all sectors[61].

4.4 For more than two decades, international climate targets have informed national commitments, which have in turn shaped the energy policies of many countries, including the UK. As global awareness and confidence in climate science increases, countries including the UK are reviewing their targets, with some, including the UK, already committing to decarbonise at a much faster rate than previously expected.

The UK Context

4.5 The UK has demonstrated global leadership on climate change. In July 2019, it became the first major economy to legally commit to reducing its greenhouse gas emissions to net zero by 2050[62].

4.6 In their 2019 Report[63], the UK's Committee on Climate Change (**CCC**) advise that consistently strong deployment of low-carbon generation in the lead up to 2050 will be required to meet net zero, including "…*at least 75GW of offshore wind*"[64].

[60] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty at Section A.1.
[61] As above at Section C.2.
[62] The Climate Change Act 2008 (2050 Target Amendment) Order 2019.
[63] Committee on Climate Change. Net Zero Technical Report. 2019 (CCS Net Zero report).

4.7 The adoption of a net zero target by 2050, requires a substantial reduction in the carbon emissions from transport and heat. This in turn is expected to create a substantial additional demand for low-carbon electricity in the 2030s and 2040s. This additional demand places a new urgency on the development of new and additional sources of low-carbon electricity that must be established in the 2020s.

The Role of Offshore Wind: 40GW by 2030

4.8 The Queen's Speech to the UK Parliament in December 2019[65], confirmed that climate change and the environment are central to the Government's legislative agenda. The UK government has pledged to deliver 40GW of offshore wind by 2030, up from the 30GW target in the Offshore Wind Sector Deal, launched in March 2019.

4.9 This pledge represents a quadrupling of the UK's installed offshore wind capacity within the next decade and reflects Government's aim to accelerate its journey in order to deliver net zero greenhouse gas emissions. As set out in Part 2 above, the development of large-scale offshore wind farms typically takes in the region of 8 years +. Projects that are not consented, in planning or well-advanced are unlikely to contribute by 2030.

The Contribution of Hornsea Three

4.10 Hornsea Three could be the world's largest offshore wind farm yet.

4.11 With a current estimated electrical installed capacity of at least 2.4GW, it has the potential to generate enough electricity to power well over 2 million UK homes per annum.

4.12 That contribution will significantly help to reduce the UK's greenhouse gas emissions, by offsetting well over 3.6 million tonnes of carbon dioxide (**CO_2**) emissions per annum and over 128.2 million tonnes of CO_2 over the lifetime of the project[66].

The Clear and Urgent Need for Hornsea Three

4.13 The fundamental importance of and need to urgently deliver Hornsea Three is therefore clear and demonstrable.

4.14 It flows from the important and urgent requirement to deliver massive amounts of renewable energy generating capacity to meet the UK's legally binding net zero commitment in response to the latest climate science and, in turn, from the size of the contribution expected from offshore wind, as confirmed by the Government's commitment: 40GW of offshore wind by 2030.

[64] CCS Net Zero report at page 191.
[65] https://www.gov.uk/government/speeches/queens-speech-december-2019.
[66] This is based on an approximate capacity of 2.4GW, a conservative 5-year average load factor for offshore wind of 38.74% and an "all fossil fuels" emissions statistic of 450tonnes/GWh of electricity supplied (BEIS, DUKES, July 2019) and a project lifespan of 35 years.

4.15 As detailed in the Planning Statement accompanying the Application (see Section 4 of the Planning Statement (**REF APP-177**)), the need for significant quantities of offshore wind already well-established in the relevant National Policy Statements (EN-1 and EN-3) which pre-date the more recent commitments.

4.16 Since the NPSs were published in 2011, there have been significant developments to UK energy and climate policy. A legal and policy update highlighting the key changes to law and policy since the submission of the Planning Statement is appended at (Annex B to this document).

4.17 The energy industry has also continued to evolve with the cost of many key technologies falling significantly, which the CCC note is an indication of "…*major changes to what is possible*…". There is now an even greater urgency for offshore wind generation, particularly large projects like Hornsea Three which are deliverable in the mid-2020s, given announcements made in 2019 relating to nuclear deployment in the UK. Offshore wind is now one of the lowest cost forms of energy and one that can be deployed at scale within relatively short timeframes. It is essential to meet the Government's decarbonisation, security of supply and affordability policies.

4.18 This IROPI submission is accompanied by a Statement of Need (Annex C to this document) which demonstrates that the deployment of offshore wind, and specifically Hornsea Three, is needed to make a significant contribution to the Government's national policy objectives of:

(a) Decarbonisation;

(a) Ensuring security of supply; and

(b) Affordability.

4.19 As detailed in the Statement of Need:

(a) The UK has clear legal commitments to decarbonise. The decarbonisation of electricity generation assets is of vital importance to meeting these legal obligations.

(b) The need for greater capacities of low-carbon UK generation to come forward with pace continues to develop through Government policy. The adoption of a net zero target creates greater urgency in that there is now a need for substantial deployment of low-carbon generation in the 2020s to support the decarbonisation of heat and transport in the 2030s. This is also reflected in the latest analysis by the CCC, who states that consistently strong deployment of low-carbon generation will be needed in order to quadruple low-carbon supply by 2050 and meet the UK net zero commitment, including at least 75GW of offshore wind[67].

(c) Current analysis by National Grid ESO[68]:

[67] CCS Net Zero report at page 191.
[68] National Grid. Future Energy Scenarios. National Grid, 2019.

(i) Great Britain's (GB) electricity demand is anticipated to grow by up to 5% by 2030 as a result of the electrification of transport and home heating. Demand is anticipated to increase by 30 to 50% by 2050, with higher demand growth anticipated in those scenarios that meet the CCA2008 80% emissions reduction target, as decarbonisation of transport, home heating and other sectors progresses;

(ii) GB installed generation capacity will need to increase (from c.110GW today) to 130 – 160GW by 2030 to meet demand (i.e. a 36 – 56GW increase, following nuclear (8GW) and coal closures (also 8GW) pre 2030), with indicatively 53-66% of that capacity being low-carbon (vs. 48% today). If the UK is to meet its net-zero commitment, the share of generation capacity which is low-carbon is likely to need to be at the higher end of that range;

(iii) Installed electricity generation capacity will need to grow even further beyond 2030 to meet demand and carbon targets. National Grid ESO estimated in its net zero sensitivity scenario that in 2050, the UK will need c.20% more generation capacity to meet net-zero than it would need to achieve 80% carbon emission reduction by 2050 (CCA2008); and

(iv) In order to meet the UK's legally binding 'net zero' target, a radical transformation to our national energy ecosystem is required. This means even more low-carbon, wind and solar generation capacity than forecasted in even the most ambitious scenarios that would have met the CCA2008 2050 80% target will be required.

(d) The Government's Low Carbon Transition Plan made in 2009[69] (and around which the NPSs were based) identified major initiatives to reduce the carbon intensity of electricity generation which have not yet delivered at the scale or timeframes expected. These include large-scale Carbon Capture Usage & Storage (CCUS), wave and tidal and new nuclear power. Whilst these technologies may well ultimately generate substantial electricity in the future, they are unlikely to do so at scale in the 2020s and are therefore unable to fully address the urgent need for the substantial increase in low-carbon electricity in the 2020s.

(e) Offshore wind is a UK success story and has demonstrated that it can deliver low carbon generation at scale. Whilst no single technology will bridge the energy gap, Hornsea Three would contribute to a diverse and secure generation mix, reducing the UK's reliance on imports.

(f) Offshore wind power is highly competitive on a per MWh generated basis and therefore economically attractive versus other forms of conventional and low-carbon technologies.

[69] HM Government. The UK Low Carbon Transition Plan. HMSO, 2009.

(g) In 2019, the latest offshore wind farm projects secured record low prices in the government's third Contracts for Difference (CfD) auction round, with prices as low as £39.65/MWh, which is below the predicted wholesale price.

(h) Size remains important and maximising generating capacity across available transmission infrastructure improves the economic efficiency of projects, bringing power to market at the lowest cost possible.

4.20 As concluded in the Statement of Need, Hornsea Three can make a large, meaningful and timely contribution to decarbonisation and security of supply, while helping lower bills for consumers throughout its operational life, thereby addressing all important aspects of the UK's legal obligations and existing and emerging Government policy.

4.21 The case for Hornsea Three is urgent and important.

A clear public interest

4.22 There is a clear public interest in Hornsea Three proceeding.

4.23 That flows from its unique ability to provide a massive contribution in the mid to late 2020s towards the achievement the UK Government's national policies, which demand the urgent decarbonisation, ensuring security of supply and affordability discussed in Section 4.19 above.

4.24 DEFRA 2012[70] advises that the NPSs and other documents setting out Government policy (e.g. the UK Renewable Energy Roadmap) provide a context for competent authorities in considering the HRA Derogation Provisions and that projects which enact or are consistent with national strategic plans or policies (e.g. such as those provided for in NPS EN-1 and EN-3) are more likely to show a high level of public interest.

4.25 Hornsea Three is consistent with and enacts important national policy as demonstrated in the sections above.

Combatting climate change

4.26 The public interest in Hornsea Three goes further than meeting legal and policy targets. Hornsea Three could be instrumental in combating climate change and the threats it poses to human beings and the environment (including seabirds). The health and well-being of our species, and the future of our planet, depends on the rapid deployment of renewable resource such as, and including, Hornsea Three.

[70] DEFRA 2012, at paragraph 26.

4.27 The table below outlines the priority climate change risks identified in the UK CCC's "UK Climate Change Risk Assessment"[71]. The Applicant has categorised these risks as applicable to human health, public safety and primary importance for the environment (i.e. the "core" IROPI elements), all of which could be combatted by the deployment of large-scale offshore wind resource such as, and including, Hornsea Three.

Table 4.1 Priority climate change risks identified in the UK CCC's UK Climate Change Risk Assessment.

UK Climate Change Risk Assessment – Priority Risk	Human Health	Public Safety	Primary importance for the environment
Flooding and coastal change risks to communities, businesses and infrastructure.	Risks of drowning, injury and disease, as well as negative effects on mental health and wellbeing.	Costs and disruption to communities, businesses and the UK economy potentially leading to social unrest.	Degradation of coastal habitats and waterways from physical stresses and pollution.
Risks to health, well being and productivity from high temperatures.	The number of heat related deaths could more than double by the 2050s from the current 2000/year baseline (2017).		-
Risks of shortages in the public water supply, and for agriculture, energy generation and industry, with impacts on freshwater ecology.	Clean water is a fundamental requirement to human health and public safety, including food and sanitation.		Freshwater environments are at risk from water availability, species declines and habitat degradation.
Risks to natural capital, including terrestrial, coastal, marine and freshwater ecosystems, soils and biodiversity	Quality and availability of water and the magnitude of flood events are likely to impact on human health and public safety.		Direct impacts on the distribution of UK biodiversity and the composition of terrestrial, costal, marine and freshwater ecosystems are already being observed. There is clear evidence of northwards shifts in species distributions and the timing of seasonal events due to climate change.
Risks to domestic and international food production and trade	Disruption to domestic food production and international food production and trade are likely to lead to rises in food prices, leading to	Rises in food prices, leading to public safety stresses from pressures to health services, increased inequality and	Climate change is linked to increased frequency of severe weather events, which can affect international food production, trade and supply chains.

[71] UK Climate Change Risk Assessment 2017
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584281/uk-climate-change-risk-assess-2017.pdf

UK Climate Change Risk Assessment – Priority Risk	Human Health	Public Safety	Primary importance for the environment
	economically disadvantaged and vulnerable groups in particular having less access to a healthy diet.	the marginalisation of some socio-economic groups.	Incremental changes in climate will affect productivity and require increased stewardship of natural resources including soils and water to prevent domestic agricultural degradation.
New and emerging pests, diseases and invasive non-native species (more research needed)	Climate change through warmer temperatures is likely to lead to new pests and diseases, including invasive non-native species, which has the potential to cause severe impacts to human health.		Invasive non-native species have the potential to cause severe impacts on flora, fauna, particularly in already vulnerable and rare habitats.

4.28 Hornsea Three will be located in the southern North Sea. CEFAS data[72] describes a significant long-term warming trend (by around 2°C) in the North Sea over the past century, which is significantly faster than the rate of warming of global oceans. Our understanding of the effects of warming on the physical processes and ecology of the North Sea continues to advance.

4.29 It is relevant to note, as the Applicant has been asked to prepare a derogation case in part for effects on the assemblage (kittiwake) feature of the FFC SPA, that kittiwake is a species evidenced to be more sensitive to climate change than other seabirds. As a clear example, climate change has been linked with an 87% decline in breeding kittiwakes on Orkney and Shetland, and by 96% at St Kilda since 2000[73]. This is in comparison with a 0.35 – 0.36% /annum decline from in-combination offshore wind farm collision risk mortality, based on the Applicant's interpretation of Natural England's position.

4.30 Recent research by Marine Scotland (2019)[74] describes the observed impact of increases in sea surface temperature on abundance of sandeel, which is a key prey species for seabird species including kittiwake and puffin. Sadykova et al (2020)[75] predict significant spatial shifts in a number of UK predator prey relationships by 2050, including kittiwake/sandeel, guillemot/herring, grey seal/sandeel, with all but one model showing significant decreases overall.

4.31 This research demonstrates that the likely effect of climate change will be further declines of these seabird and mammal species within the North Sea due to a failure of prey populations.

[72] https://www.cefas.co.uk/impact/case-studies/130-years-of-measuring-seawater-temperature/.
[73] RSPB, 2017: Kittiwake joins the red list of birds facing risk of global extinction. Accessed at: https://www.rspb.org.uk/about-the-rspb/about-us/media-centre/press-releases/kittiwake-joins-the-red-list-of-birds-facing-risk-of-global-extinction/
[74] Régnier, T., Gibb, F.M. & Wright, P.J. Understanding temperature effects on recruitment in the context of trophic mismatch. *Sci Rep* **9,** 15179 (2019) doi:10.1038/s41598-019-51296-5.
[75] Ecological costs of climate change on marine predator–prey population distributions by 2050 Dinara Sadykova1,2 | Beth E. Scott1 | Michela De Dominicis3 | Sarah L. Wakelin3 |Judith Wolf3 | Alexander Sadykov1,2,4.

4.32 The Marine Climate Change Impacts Partnership[76] describes how features for which marine protected areas (MPAs) have been designated are potentially vulnerable to climate change. Where an MPA has been designated for its physio-geographic features (i.e. subtidal sandbanks), any changes due to climate change are unlikely to compromise the achievement of conservation objectives. In contrast, designations based on biogenic habitats, such as seagrass beds, or species could be compromised by climate change. For example, Weinert et al (2016) modelled the effect of climate change (2001-2099) on 75 North Sea benthic species. Of these species, 49 were predicted to result in 100% habitat loss while only 11 species were predicted to gain habitat. Habitats vulnerable to climate change are not adversely impacted by Hornsea Three would benefit from climate change mitigation which low carbon generation provides. This demonstrates that climate change mitigation including low carbon generation is an essential part of protecting the coherence of the UK MPA network.

Socioeconomic benefits

4.33 The public interest in Hornsea Three goes further still and includes substantial economic benefit to the UK and its regions.

4.34 Hornsea Three is capable of providing substantial benefits to the UK economy including facilitating confidence in the UK supply chain, growing a skilled workforce and providing wider community benefits.

4.35 The Application included a socio-economic assessment of the potential benefits of Hornsea Three[77]. The two primary economic benefits identified are employment (during the construction and operations and maintenance (**O&M**) periods) and investment in the UK economy.

Employment

4.36 During construction, across the UK the potential employment ranges from 7,880 and 32,120 person years of employment under the low and high construction impact scenarios respectively. This includes the direct and supply chain employment impacts. In annual terms, the construction phase of Hornsea Three could support between 1,750 and 7,140 Full Time Employees (**FTEs**) under the low and high scenarios respectively.

4.37 During the O&M phase, the assessment concludes that the potential employment impact could be around 1,290 FTE jobs per year under the baseline O&M impact scenario. This includes the direct and supply chain employment impacts. Of the 1,290 FTE, the direct employment impact would be around 120 FTEs, as it is assumed that all direct O&M employment would be UK based and directly employed by Hornsea Three.

[76] Marine Climate Change Impacts Partnership, 2015: Marine climate change impacts – Implications for the implementation of marine biodiversity legislation. Accessed at: http://www.mccip.org.uk/media/1611/mccip_special_topic_report_card_-2015.pdf
[77] Volume 3, Chapter 10: Socioeconomics of the ES (APP-082)

4.38 These jobs would be sustained over a much longer period (in the order of 35 years, if the project is not repowered) and provide more solid foundations for the growth of the sector across the UK. It is noted that the assessment of employment and Gross Value Added (**GVA**) benefits in **APP-082** only include direct and indirect effect and does not include induced effects (or 'personal expenditure'), associated with the expenditure of employment incomes by the workforce. This will support further large-scale employment in both the two primary regions – the Humber and East Anglia, and across the UK across a range of mainly service sectors including hospitality, restaurants, and the retail sector.

4.39 Hornsea Three can provide a substantial contribution to establishing and maintaining a skilled workforce in the UK with the associated economic benefits (direct and indirect) that brings.

Investment

4.40 During the construction phase, two scenarios were considered in the socio-economic assessment (low and medium) for the East Anglia region and three scenarios (low, medium and high) for the Humber region. Although precautionary and conservative, the socio-economic assessment concluded:

Table 4.2: Conclusions from the socio-economic assessment.

Stage		UK
Construction	Direct	£260 - £940 million
	Indirect	£240 – £1,120 million
	Total	£500 - £2,060 million
Operation & Maintenance	Direct	£20 million GVA per year over 35 years
	Indirect	£70 million GVA per year over 35 years
	Total	£90 million GVA per year over 35 years
Decommissioning		£20 - £30 Million (£80,000 per MW, leading to £192 million).

4.41 Even using precautionary measurements Hornsea Three has the potential to generate £90 million GVA per year over 35 years (excluding any repowering and decommissioning benefits). On any measure this is a substantial contribution to the UK economy.

Supply chain and skills development

4.42 The UK Government is clear that they want to deliver on their net zero commitment in a way that maximises the opportunities for UK industry of both the UK's transition and the global shift to clean growth.

4.43 This is reflected in the UK's Industrial Strategy, Clean Growth Strategy (BEIS, 2017) and UK Offshore Wind Sector Deal (BEIS, 2019), with the sector committing to enhance the UK's supply chain capabilities and increase competitiveness to enable UK suppliers to benefit from the significant export opportunity that exists.

4.44 As part of the Offshore Wind Sector Deal, the industry is investing up to £250 million to develop the supply chain, working with Local Enterprise Partnerships (LEPs), councils and development agencies, increasing productivity and fostering innovation. This includes the Offshore Wind Growth Partnership, a new programme of up to £100 million, which will help UK companies seeking to grow their business in the rapidly-growing global offshore wind market.

4.45 Hornsea Three will also support the continued development of the UK's offshore wind clusters, particularly those located near the development, through continued engagement with local business networks in order to increase supply chain participation. For example, Ørsted is the Cluster Champion for the Humber region and is a leading industry partner in the University of Hull's 'Aura' initiative, a catalyst for innovation in the Humber. This should enable wider benefits to be captured by those regions as the industry grows.

4.46 In addition to job generation and investment, Hornsea Three will also support the development of skills which the offshore wind industry needs to flourish. Building up to 30GW of offshore wind capacity by 2030 could support 27,000 jobs (up from 11,000 today). This figure will be higher with the new 40GW by 2030 target.

4.47 Ørsted (the Applicant's parent company) is committed to helping to develop people with the right skills required to the deliver the UK's offshore wind ambitions, specifically within the regions in which it operates. This commitment is reflected in the Application, as the Applicant has committed to develop and implement a Skills and Employment Plan for Hornsea Three, which must be approved by the relevant planning authority in consultation with the New Anglia LEP and the Humber LEP. This is secured through the draft DCO. Skills is also one of the key pillars of Supply Chain Plans, a current pre-requisite for projects of 300MW or more applying for a CfD.

4.48 Ørsted's commitment to economic investment and to education in the UK has been demonstrated across its wider portfolio. Ørsted adopts a holistic, cross-project approach to developing skills across the UK. The size and location of Hornsea Three make it integral to future initiatives. For example, our current programme includes[78]:

(a) **Apprenticeships**: Partnering with the Grimsby Institute and Furness College to offer a new offshore wind turbine apprenticeship on the East and West coasts, respectively. The three-year apprenticeship comprises of one year of classroom-based learning, followed by two years of working on site with Ørsted. The apprentices will undertake a BTEC Level 3 in Engineering and Maintenance &

[78] Our current support for skills and education is indicative of what we would seek to provide in the future. The exact format of any future initiatives would be finalised nearer the time and would be subject to Ørsted making a positive Financial Investment Decision in respect of Hornsea Three.

Operations Engineering Technician (MOET) qualification, which incorporates a BTEC Level 3 in Engineering, and if they successfully complete the programme will become full-time employees at Ørsted. The apprenticeship scheme is currently in its third year, with recruitment of the next round of apprentices due to commence shortly.

(b) **Skill Events**: Facilitating an increased focused on Science Technology Engineering and Maths (STEM) through participation in regional and national initiatives focused on inspiring the next generation. For example, during the development phase, Hornsea Three supported a number of regional skills events, including the East of England Energy Group's annual Skills for Energy event.

(c) **Community Benefits**: Ørsted has also supported skills initiatives by assigning funds from Ørsted's Community Benefit Funds (CBFs). CBFs are voluntary initiatives designed to provide funding to communities located close to the wind farms and other infrastructure. For example, Ørsted's Walney Extension CBF and East Coast Fund have ring-fenced £100,000 and £75,000 per annum respectively for exclusive use on skills and training initiatives. The Skills Funds are divided up into different strands, providing hardship loans, financing STEM Engineering Courses and supporting the development and delivery of a STEM training and/or education courses.

(d) **Skills and Employment Opportunities**: Collaborating with the LEPs, local authorities and education providers through Ørsted's Skills and Employment Plans to promote opportunities and develop skills in the regions where we operate.

(e) **Innovation**: Partnering with local University Technical Colleges (UTCs) and strategic partnerships with UK universities, including supporting PhDs. For example, Ørsted has partnered with the Universities of Sheffield, Durham and Hull, alongside Siemens Gamesa, in a £7.64 million, five-year collaboration programme (the 'Prosperity Partnership') with the Engineering and Physical Sciences Research Council. Ørsted is also partnering with Oxford University, signing a 5-year research collaboration agreement with them in 2017, focused on optimising foundation designs.

Public interest

4.49 While the Applicant is a private entity, the strategy to harness the UK's offshore wind resource to produce renewable electricity can only be delivered through the private sector. The identification and development of offshore sites and the Round 3 Zones (including the former Hornsea 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.

4.50 Critically, it is a state-led policy. From the earliest rounds of offshore wind, it has been promoted and pursued by the Government, delivered through The Crown Estate (**TCE**). This is true of Round 3 and sites such as Hornsea Three are now coming forward within Zones identified earlier in the Round 3 process by the Government and TCE. Site appraisal was initiated by the Government through Strategic Environmental Appraisals (**SEA**), with subsequent site appraisal and delivery refined by TCE through SEA and Zone Appraisal and Planning studies.

4.51 Therefore, the policy drivers for offshore wind clearly lie in and serve the public interest. However, delivery of that public interest must be through private companies such as Ørsted A/S (the ultimate parent company of the Applicant). Ørsted A/S has over 25 years' experience and a strong track record developing, building and operating offshore wind farms; with 5.6GW of constructed capacity globally and a further 4.3GW currently under construction.

4.52 MN 2000 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*."[79]

4.53 It is beyond doubt that projects developed by private bodies can be considered where such public interests are served, as in this case.

A long-term interest

4.54 For IROPI to arise, the public interest would usually be long-term. Each public interest identified above is a long-term UK interest – decarbonisation, security of supply, provision of low-cost energy, protecting the human species and the environment, providing employment opportunities, contribution to the UK economy, provision of skills training and community benefit.

4.55 Hornsea Three will be capable of providing clean energy generation for around 35 years (possibly longer subject to repowering) and it can be deployed within a relatively short time frame (within the 2020s).

4.56 As demonstrated in the Statement of Need, delivery of offshore wind resource is urgently required to bridge the gap between the move away from carbon generation technologies to the large-scale deployment of other technologies such as nuclear, wave and tidal.

4.57 All scenarios forecast to achieve net zero involve the large-scale deployment of renewable generation, with the CCC stating that at least 75GW of offshore wind is required[80]. Electricity demand is predicted to rise and there is a long-term interest in ensuring that the lights remain on, whilst also meeting decarbonisation targets and combatting climate change.

[79] MN 2000 Guidance at page 58
[80] CCS Net Zero report at page 191.

4.58 Large energy infrastructure projects have a long lead time due to the planning and consenting framework. The potential contribution of Hornsea Three is significant to decarbonisation and security of supply, but also strategically important, to ensuring continuity in the offshore wind sector. Through the Offshore Wind Sector Deal, industry has committed to strengthening the competitiveness of the UK supply chain, consistent with the UK's Clean Growth Strategy. This is a long-term endeavour which seeks to maximise the advantages for UK industry from the global shift to clean growth.

4.59 Economic benefits will derive not only from the direct construction, operation and maintenance of Hornsea Three but from the important confidence it will bring to the UK supply chain, given Ørsted's track record in delivering its large-scale infrastructure projects in a timely manner.

Overriding Interest

A Balancing Exercise

4.60 Consideration of IROPI necessarily involves a balancing exercise and an exercise of planning judgement by the decision maker, which in the case of the Application is the Secretary of State.

4.61 In case **C-239/0436,** Advocate General Kokott said[81]:

"The necessity of striking a balance results in particular from the concept of 'override', but also from the word 'imperative'. Reasons of public interest can imperatively override the protection of a site only when greater importance attaches to them. This too has its equivalent in the test of proportionality, since under that principle the disadvantages caused must not be disproportionate to the aims pursued."

4.62 Or, as put by the EC in C-239/04 [82]:

"…the choice requires a balance to be struck between the adverse effect on the integrity of the SPA and the relevant reasons of overriding public interest.[83]"

4.63 It will be for the Secretary of State therefore to make a judgement on whether the substantial, long-term public interest that Hornsea Three delivers, outweighs any potential harm to each individual European site which is the subject of this submission.

Relevant UK Examples involving Renewable Energy

4.64 The Secretary of State has considered IROPI before in the context of the deployment of renewable energy, in the Able Marine Energy Park (**AMEP**) DCO.

4.65 In the decision letter for the AMEP DCO the Secretary of State found the following grounds constituted IROPI and outweighed the loss of 45 hectares of a Natura 2000 site[84]:

[81] Opinion of AG, C-441/03, Commission v Netherlands, paragraph 16.
[82] C-239/04, Commission v Portugal
[83] Opinion of AG, C-239/04, Commission v Portugal at paragraph 44.
[84] Secretary of State's Decision Letter dated 18 December 2013, Annex I at paragraph 17.

(a) Decarbonising the means of energy production;

(b) Securing energy supplies from indigenous sources;

(c) Manufacturing large scale offshore generators;

(d) Increasing the UK's manufacturing base; and

(e) Regenerating the Humber sub-region.

4.66 Overall the Secretary of State was satisfied that the AMEP development would make a significant contribution to these imperative needs in the long term, providing support to the offshore renewable energy industry while making a major contribution to employment and the economy.

4.67 Consistent with the AMEP DCO, previously a Planning Inspector appointed to hold an Inquiry into the Little Cheyne Court Wind Farm section 36 consent application had to consider the question of IROPI for renewable energy deployment.

4.68 Ultimately, the Secretary of State found that there would be no AEOI from the development[85]. However, following an Inquiry, the Inspector found that (should IROPI have to be considered) the urgent need for renewable energy would outweigh the risk of harm. (In this case English Nature[86] and RSPB didn't assert that any ecological harm would occur, they argued that it could not be shown that harm will not occur.) The Inspector found this to be particularly the case where there is a lack of other proposals to meet the Government's country-wide and regional targets[87].

4.69 The Applicant has provided more detailed case studies on these two decisions in Annex D to this document. From these it is evident that the public interests that Hornsea Three would similarly serve (and on a much greater scale) are plainly capable of constituting IROPI.

Hornsea Three's Overriding Interest set against the Envisaged Harm

4.70 It is for the Secretary of State to carry out a balancing exercise against any risk of harm (and the degree of such harm).

4.71 To inform the Secretary of State's exercise of judgement as to the planning balance the following sections consider the predicted impacts on the FFC SPA, the NSSR SAC and the WNNC SAC against the clear public interest in Hornsea Three.

[85] Little Cheyne Court Secretary of State Decision Letter dated 18 October 2005 at paragraph 6.6.
[86] Natural England as then was.
[87] Little Cheyne Court Inspector's Report submitted on 13 May 2005 at paragraph 461.

FFC SPA

4.72 Kittiwake is the most numerous species of gull in the world and the most oceanic in its habits. It is one of the most common seabirds in the UK[88], and although most colonies tend to be on sheer cliffs, in a few instances man-made structures such as buildings and bridges have been used.

4.73 In 2017, kittiwake was added to the IUCN Red List due to being in global decline as climate change and overfishing led to declines in prey species availability during the breeding season, leading to decreased breeding success. For example, sandeels are an important trophic link between plankton and predator fish, seabirds and mammals, and support a large industrial fishery.

4.74 Higher sea temperatures as a result of climate change are understood to delay hatch times in sandeels, and also to advance the onset of the spring plankton bloom which sandeel feed on. This means that hatch times and plankton availability are increasingly out of sync as sea temperatures rise, which has an adverse effect on growth and survival leading to low recruitment.

4.75 Climate change induced sea circulation changes are also likely to impact local populations. Surface feeding seabirds, such as black-legged kittiwake, are particularly sensitive to sandeel size and availability (Marine Climate Change Impacts Partnership, 2018).

4.76 The collision risk modelling for the reduced MDS for Hornsea Three demonstrates that the collision risk estimate apportioned to the FFC SPA from Hornsea Three is 4 birds per annum (Applicant's parameters), 65-73 birds per annum (the Applicant's interpretation of Natural England's parameters) and 7-9 birds per annum (the Examining Authority's parameters). Discussion on over-precaution inherent to collision risk for offshore wind is documented further in Part 1, Section 9 of this document.

4.77 Without prejudice to the Applicant's position that these impacts do not result in an AEOI, if the Secretary of State concludes AEOI then the Applicant's position is that the substantial public interest in Hornsea Three clearly outweighs the very low to negligible impacts Hornsea Three (alone or in-combination) may have on the kittiwake feature of the FFC SPA.

4.78 Not only will Hornsea Three be capable of delivering all of the public benefits described in the preceding sections, it could provide a significant contribution to alleviating one of the key anthropogenic pressures on kittiwake at the FFC SPA: climate change driven reductions in prey availability.

NNSSR SAC

4.79 Sandbanks which are slightly covered by seawater all the time occur widely on the Atlantic coasts of north-west Europe, and occur widely around the UK coast. The North Norfolk Sandbanks are the most extensive example of offshore linear ridge sandbanks in UK waters.

[88] Mitchell, P.I., Newton, S.F., Ratcliffe, N. and Dunn, T.E., 2004. Seabird populations of Britain and Ireland. T. & AD Poyser, London.

4.80 Due to the wide occurrence of sandbanks which are slightly covered by seawater at all times (around the UK coast and north-west Europe), the minimal footprint of long term effects within the NNSSR SAC, the absence of any species which are not typical of the southern North Sea, and the lack of any significant effect on hydrodynamic regime, the Applicant's primary position remains that there is no AEOI on the NNSSR SAC.

4.81 If the Secretary of State disagrees and concludes AEOI then the Applicant submits that that the maximum possible long term temporary[89] loss of 0.01% (41.8ha) of NNSSR SAC's sandbanks habitat from cable rock protection is substantially outweighed by the clear public interest in Hornsea Three.

WNNC SAC

4.82 As noted above, sandbanks which are slightly covered by seawater all the time occur widely on the Atlantic coasts of north-west Europe and occur widely around the UK coast. Within the WNNC SAC, sandy sediments occupy most of the subtidal area, and this feature is one of the largest expanses of sublittoral sandbanks in the UK.

4.83 Sandbanks which are slightly covered by sea water at all times are one of ten qualifying features for this site. Benthic communities on sandflats in the deeper, central parts of the Wash are particularly diverse – this is not an area affected by Hornsea Three. Hornsea Three interacts with the eastern-most extent of The WNNC SAC, and the route was designed to avoid the irreplaceable chalk habitat within the Cromer Shoal Chalk Beds MCZ immediately to the east.

4.84 The site's subtidal sandbanks comprise a variety of sandy sediment types in a highly dynamic environment; different sediment states and their associated fauna fluctuate in presence and distribution over time. In a site condition assessment published 25 January 2019, Natural England advise that 72% of the sandbank feature within the WNNC SAC is in favourable condition, and that 28% is in unfavourable condition, but recovering. Of the sub-features present, subtidal sand is in favourable condition (medium confidence), and subtidal coarse sediment, subtidal mixed sediment and subtidal mud are in unfavourable condition (low confidence), primarily due to fisheries and cabling impacts.

4.85 Due to the wide occurrence of the sandbanks feature (around the UK coast and north-west Europe), the minimal footprint of long term effects within the WNNC SAC, the absence of any species which are not typical of the southern North Sea, and the lack of any significant effect on hydrodynamic regime, the Applicant's primary position remains that there is no AEOI on the WNNC SAC.

[89] The Applicant considers this to be a long-term temporary impact as decommissioning of cable protection is committed to in the draft DCO, but should the Secretary of State conclude that this is a permanent impact the Applicant's position is that the IROPI conclusions remain robust and valid.

4.86 If the Secretary of State concludes AEOI then the Applicant's position is that the Applicant would consider that the maximum potential long term temporary[90] loss of 0.003% of the WNNC SAC's sandbanks habitat from cable rock protection is substantially outweighed by the clear public interest in Hornsea Three.

5. Hornsea Three IROPI Conclusion

5.1 This submission demonstrates a compelling case that Hornsea Three is indispensable and must be carried out for IROPI.

5.2 Hornsea Three can substantially contribute to the UK's legally binding climate change targets by helping to decarbonise the UK's energy supply, whilst also 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.

5.3 Hornsea Three will contribute to tackling the priority climate change risks identified in the UK CCC's "UK Climate Change Risk Assessment", all of which impact the core IROPI of human health, public safety and the primary importance of the environment.

5.4 Hornsea Three would also contribute significantly to the economic and social landscape in the UK as it can provide substantial employment opportunities and skills development, particularly in coastal communities, whilst also playing a major role in supporting the UK's supply chain.

5.5 If the Secretary of State finds AEOI in respect of any of the relevant European sites then there is a demonstrable overriding public interest in Hornsea Three and the policy objectives it would serve, which outweighs the risk of any adverse impact on each site. To reach such a conclusion would be consistent with the decision taken in respect of the AMEP DCO.

[90] As above.