NORTH FALLS

Offshore Wind Farm

ENVIRONMENTAL STATEMENT

Chapter 4 Site Selection and Assessment of Alternatives

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NORTH FALLS
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Glossary of Acronyms

AEoI	Adverse Effect on Integrity
AfL	Agreement for Lease
AIL	Abnormal Indivisible Loads
AIS	Air Insulated Switchgear
ALARP	As Low As Reasonably Practicable
AONB	Area of Outstanding Natural Beauty
BEIS	Department for Business, Energy and Industrial Strategy
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
CfD	Contracts for Difference
CIAL	Corridor Identification and Approval for Linear Activities
CION	Connection and Infrastructure Options Note
CSZ	Core Sustenance Zones
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DESNZ	Department for Energy Security and Net Zero
DIO	Defence Infrastructure Organisation
EACN	East Anglian Connection Node
EIA	Environmental Impact Assessment
EN-1	Overarching National Policy Statement for Energy
EN-3	National Policy Statement for Renewable Energy
EN-5	National Policy Statement for Electricity Networks
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
FLL	Functionally Linked Land
FWAG	Farming and Wildlife Advisory group
GCN	Great Crested Newt
GGOW	Greater Gabbard Offshore Wind Farm
GGOWL	Greater Gabbard Offshore Winds Limited

GIS	Gas Insulated Switchgear
GWF	Galloper Offshore Wind Farm
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HHA	Harwich Haven Authority
HRA	Habitats Regulations Assessment
IEMA/s	Institute of Environmental Management and Assessment
IMO	International Maritime Organisation
KKE	Kentish Knock East
LBPC	Little Bromley Parish Council
LNR	Local Nature Reserve
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MCZA	Marine Conservation Zone Assessment
MMO	Marine Management Organisation
MoD	Ministry of Defence
MPS	Marine Policy Statement
NBN	National Biodiversity Network
NCN	National Cycle Network
NFOW	North Falls Offshore Wind Farm Limited
NGC	National Grid Company
NGET	National Grid Electricity Transmission
NNR/s	National Nature Reserves
NPS/s	National Policy Statement/s
NSIP	Nationally significant infrastructure project
N2T	Norwich to Tilbury
OCSS	Offshore Coordination Support Scheme
OFTOs	Offshore Transmission Owners
OSP/s	Offshore substation platform/s
OTE	Outer Thames Estuary
OTNR	Offshore transmission Network Review

OWF/s	Offshore wind farm/s
PEIR	Preliminary Environmental Information Report
PLA	Port of London Authority
PRoW/s	Public Rights of Way/s
RAG	Red Amber Green Assessment
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
RTD	Red throated diver
RWE	RWE Renewables UK Swindon Limited
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAR	Search and Rescue
SEA/s	Strategic Environmental Assessments
SF_6	Sulphur Hexafluoride
SLVIA	Seascape, Landscape and Visual Impact Assessment
SPA	Special Protection Area
SPZs	Source Protection Zones
SRN	Strategic Road Network
SSER	SSE Renewables Offshore Windfarm Holdings Limited
SSSI	Site of Special Scientific Interest
TH	Trinity House
TSS	Traffic Separation Scheme
UKHPI	UK Habitats of Principal Importance
VEOWL	Five Estuaries Offshore Wind Farm Limited
WTG	Wind Turbine Generator

Glossary of Terminology

400kV onshore cable route	Onshore route within which the onshore substation to national grid connection point onshore export cables and associated infrastructure would be located.
400kV onshore cables	The cable circuits which take the electricity from the onshore substation on to the national grid connection point. These also comprise High Voltage Alternative Current (HVAC) cables, buried underground.
Array area	The offshore wind farm area, within which the wind turbine generators, array cables, platform interconnector cable, offshore substation platform(s) and/or offshore converter platform will be located.
Array cables	Cables which link the wind turbine generators with each other, the offshore substation platform(s) and/or the offshore converter platform.
Bentley Road improvement works	Works involving the widening and improvement of the carriageway along Bentley Road, required to facilitate heavy goods vehicle and abnormal indivisible load access to the onshore cable route and the onshore substation.
Cable circuit (onshore)	The onshore export cables are comprised of cable 'circuits'. Each cable circuit is typically comprised of three power cables, as well as fibre cables and earth cables. It is expected that each circuit would compromise up to seven cables in total.
Cable ducts	Housing for the onshore export cables, typically comprising plastic high-density polyethylene (HDPE) pipes buried underground. Each cable circuit will potentially comprise up to seven individual ducts (i.e. one per cable).
Former array areas	The two distinct offshore wind farm areas (including the 'northern array area' and 'southern array area') which comprised the North Falls offshore wind farm at scoping and PEIR stage.
Haul road	The track along the onshore cable route used by construction traffic to access different sections of the onshore cable route.
Horizontal directional drill	Trenchless technique to bring the offshore export cables ashore at landfall. The technique will also be the primary trenchless technique used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Interconnector cable	Former cable between the northern and southern array areas
Interconnector cable corridor	Former corridor of the seabed between the northern and southern array areas within which the interconnector cable will be located.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Landfall compound	Compound at landfall within which horizontal directional drill (HDD) or other trenchless technique would take place.
Landfall search area	The area considered at PEIR, comprising the Essex coast between Clacton-on-Sea and Frinton-on-Sea within which the landfall is located.
National grid connection point	The grid connection location for the Project. National Grid are proposing to construct new electrical infrastructure (a new substation) to allow the Project to connect to the grid, and this new infrastructure will be located at the National Grid connection point.

National grid substation connection works	Infrastructure required to connect the Project to the national grid connection point.
Offshore cable corridor	The corridor of seabed from array areas to the landfall within which the offshore export cables will be located.
Offshore converter platform	Should an offshore connection to a third party HVDC cable be selected, an offshore converter platform would be required. This is a fixed structure located within the array area, containing HVAC and HVDC electrical equipment to aggregate the power from the wind turbine generators, increase the voltage to a more suitable level for export and convert the HVAC power generated by the wind turbine generators into HVDC power for export to shore via a third party HVDC cable.
Offshore export cables	The cables which bring electricity from the offshore substation platform(s) to the landfall, as well as auxiliary cables.
Offshore substation platform(s)	Fixed structure(s) located within the array area, containing HVAC electrical equipment to aggregate the power from the wind turbine generators and increase the voltage to a more suitable level for export to shore via offshore export cables.
Onshore cable corridor(s)	Onshore corridor(s) considered at PEIR within which the onshore cable route, as assessed at ES, is located.
Onshore cable route	Onshore route within which the onshore export cables and associated infrastructure would be located.
Onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
Onshore PEIR boundary	The boundary encompassing the Project landfall, onshore cable route and onshore substation, as considered within the PEIR.
Onshore project area	The boundary within which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and cables to the national grid substation).
Onshore scoping area	The boundary within which all onshore infrastructure required for the Project will be located, as considered within the North Falls EIA Scoping Report.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the national grid.
Onshore substation construction compound	Area set aside to facilitate construction of the onshore substation. Will be located adjacent to the onshore substation.
Onshore substation works area	Area within which all temporary and permanent works associated within the onshore substation are located, including onshore substation, construction compound, access, landscaping, drainage and earthworks.
Onshore substation zone	The area considered at PEIR, within which the onshore substation will be located.
PEIR offshore project area	The boundary encompassing the offshore cable corridor and array areas, as considered within the PEIR.

Temporary construction compound	Area set aside to facilitate construction of the onshore cable route. Will be located adjacent to the onshore cable route, with access to the highway where required.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Transition joint bay	Underground structures that house the joints between the offshore export cables and the onshore export cables
Trenchless crossing	Use of a technique to install limited lengths of cable below ground without the need to excavate a trench from the surface, used in sensitive areas of the onshore cable route to prevent surface disturbance. Includes techniques such as HDD.
Trenchless crossing compound	Areas within the onshore cable route which will house trenchless crossing (e.g. Horizontal Directional Drilling) entry or exit points.
Wind turbine generator	Power generating device that is driven by the kinetic energy of the wind

4 Site Selection and Assessment of Alternatives

4.1 Introduction

1. This chapter of the Environmental Statement (ES) presents a description of the site selection process and assessment of alternatives undertaken by North Falls Offshore Wind Farm Limited (herein 'NFOW' or 'the Applicant') to define the North Falls offshore wind farm (herein 'North Falls' or the Project') offshore and onshore project areas.

2. North Falls is an extension to the existing Greater Gabbard Offshore Wind Farm (GGOW) and was identified during the extension leasing round launched by The Crown Estate in 2017 and finalised in 2019 (see Section 4.4).

4.1.1 Legislation, policy and guidance

3. The site selection process for offshore wind farms (OWFs) in the UK is governed by the existing legislative, policy and guidance framework for the development of electrical infrastructure and for environmental assessment within the UK (see ES Chapter 3 Policy and Legislative Context (Document Reference: 3.1.5) for more information). The key pieces of legislation, policy and guidance which set the framework for site selection and the assessment of alternatives for OWFs in the UK are summarised in Table 4.1 below.

4. The Planning Act 2008 makes provision for National Policy Statements (NPSs). NPSs are designed to set the policy framework for determination of nationally significant infrastructure project (NSIP) applications. The three NPS which are relevant to North Falls are:

   - The Overarching NPS for Energy (NPS EN-1) (Department for Energy Security and Net Zero (DESNZ), 2023a);
   - The NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNZ, 2023b), which covers nationally significant renewable energy infrastructure (including offshore generating stations in excess of 100MW); and
   - The NPS for Electricity Networks Infrastructure (NPS EN-5) (DESNZ, 2023c), which covers the electrical infrastructure associated with an NSIP.

Table 4.1 Legislation, policy and guidance considered during the site selection and assessment of alternatives process

Legislation, policy & guidance	Details
Legislation	
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017	The consideration of alternatives and major design decisions made during the development of a project has been part of Environmental Impact Assessment (EIA) legislation since the adoption of the original EIA directive in UK law under the European Union (EU) EIA Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC). The 2017 EIA Regulations, at Schedule 4, paragraph 2, require an ES to include "*a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the*

Legislation, policy & guidance	Details
	developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".
The Electricity Act 1989	Schedule 9 of The Electricity Act 1989 sets out the obligations for a generation installation licence holder to mitigate the effects on the environment, including when constructing a generating station, the licence holder "*shall have regard to…preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest*". In addition, Section 9 of the Act sets out the duties of an electricity distributor and transmission licence holder which could influence the site selection process for grid infrastructure, including that "to develop and maintain an efficient, co-ordinated and economical system of electricity distribution".
The Planning Act 2008	The Planning Act 2008 is the primary legislation that established the legal framework for applying for, examining and determining applications for NSIPs taking into account the guidance in NPSs.
National Policy	
Overarching NPS for Energy (EN-1)	The Overarching NPS for Energy (EN-1) states "*This NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option from a policy perspective*" (paragraph 4.3.9). However, "*Applicants are obliged to include in their ES, information about the reasonable alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility*." (paragraph 4.3.15). NPS EN-1 also states "*Given the level and urgency of need for new energy infrastructure, the Secretary of State should, subject to any relevant legal requirements (e.g. under the Habitats Regulations) which indicate otherwise, be guided by the following principles when deciding what weight should be given to alternatives:* • *the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner; and* • *only alternatives that can meet the objectives of the proposed development need to be considered."* (paragraph 4.3.22) In addition, NPS EN-1 includes the following policy with regards to grid connection options: "*The historical approach to connecting offshore wind resulted in individual radial connections developed project-by-project. This may continue to be the most appropriate approach for some areas with single offshore wind projects that are not located in the vicinity of other offshore wind and / or offshore infrastructure that is planned or foreseen in the near future. For regions with multiple windfarms or offshore transmission projects it is expected that a more coordinated approach will be delivered. For these areas, this approach is likely to reduce the network infrastructure costs as well as the cumulative environmental impacts and impacts on coastal communities by installing a smaller number of larger connections, each taking power from multiple*

Legislation, policy & guidance	Details
	windfarms instead of individual point-to-point connections for each windfarm." (paragraph 3.3.71). Co-ordinated transmission options considered for North Falls are discussed in Section 4.1.5 of this ES chapter.
NPS for Renewable Energy Infrastructure (EN-3)	The NPS for Renewable Energy Infrastructure (EN-3), which relates to renewable energy generation infrastructure (transmission infrastructure is covered by EN-1 and EN-5) states that, in relation to consideration of alternatives for site selection and design: "*The specific criteria considered by applicants and the weight they give to them will vary from project to project (paragraph 2.3.2).* *The choices which applicants make in selecting sites reflect their assessment of the risk that the Secretary of State, following the general points set out in Section 4.1 of EN-1, will not grant consent in any given case.* (paragraph 2.3.4). *It is for applicants to decide what applications to bring forward and the government does not seek to direct applicants to particular sites for renewable energy infrastructure other than in the specific circumstances described in this document in relation to offshore wind, such as Strategic Environmental Assessments (SEAs) and the Crown Estate Leasing Rounds.*" (paragraph 2.3.5). "*The Secretary of State should be aware of the potential for applications for extensions to existing wind farms and that there may be constraints on such leases over which the applicant will have little or no control.*" *(paragraph 2.3.15)* NPS EN-3 outlines that for offshore project areas, the Secretary of State should be satisfied that the site selection and assessment of alternatives process has been undertaken in a way that reasonably minimises adverse effects on a variety of environmental parameters. The process the Applicant has taken in this regard is described in Sections 4.4 to 4.9. NPS EN-3 further outlines factors influencing the site selection and design of offshore wind farms, including: "*In proposing sites for offshore wind and/or offshore transmission infrastructure, NSIP applicants should demonstrate that their choice of site takes into account the government's Offshore Energy SEA 4 and any successors to it.*" (Paragraph 2.8.14) "*The government is undertaking a rolling Offshore Energy SEA programme, including a research programme and data collection to facilitate future strategic and project specific assessments to achieve the 50GW ambitions*." (Paragraph 2.8.15) SEA 4 was published in 2022 which was after the selection of the former array areas (see Section 4.4.3), landfall search area (Section 4.6.1) and associated offshore cable corridor (Section 4.7) has been selected, however the process that was followed aligns with that outlined in SEA 4 which states throughout the report that impacts can be mitigated through site selection, e.g. impacts on fisheries, other marine users and seascape. The range of constraints considered in the North Falls array area site selection are outlined in Section 4.4.2.

Legislation, policy & guidance	Details
	Where applicable, references from the SEA research programme are used to inform the North Falls EIA and are listed in the relevant technical chapters of the ES. As per NPS EN-1, NPS EN-3 also states that a "*more co-ordinated approach to offshore-onshore transmission is required*" (paragraph 2.8.34). "*Co-ordinated transmission proposals are principally developed through, and as a consequence of, a process of ongoing reform through the Offshore Transmission Network Review (OTNR) with the lead party or parties for the initial co-ordination proposals varying according to the different temporal workstreams. Further details are provided in EN-5, section 2.12.*" (paragraph 2.8.37). Co-ordinated transmission options considered for North Falls are discussed in Section 4.1.5 of this ES chapter.
NPS Electricity Networks Infrastructure (EN-5)	The NPS for Electricity Networks Infrastructure (EN-5) recognises that the grid connection "terminating points" "*of new electricity networks infrastructure is not substantially within the control of the applicant*" (paragraph 2.2.1). "*Siting is determined by:* • *"the location of new generating stations or other infrastructure requiring connection to the network, and/or* • *system capacity and resilience requirements determined by the Electricity System Operator"* (paragraph 2.2.2). "*These twin constraints, coupled with the government's legislative commitment to net zero by 2050… and an ambition of up to 50GW of offshore wind generation by 2030, means that very significant amounts of new electricity networks infrastructure is required, including in areas with comparatively little build-out to date."* (paragraph 2.2.3) Whilst the NPS EN-5 directs that "*applicants retain control in managing the identification of routing and site selection between the identified initiating and terminating points or within the development zone*", this does not "*exempt Applicants from their duty to consider and balance the site-selection considerations…much less the policies on good design and impact mitigation.*" (paragraphs 2.2.5).
Planning Inspectorate Advice Note Seven: EIA	The Planning Inspectorate Advice Note Seven advises the EIA needs to explain "the reasonable alternatives considered and the reasons for the chosen option taking into account the effects of the Proposed Development on the environment" (paragraph 9.3).
Planning Inspectorate Advice Note Nine: Rochdale Envelope	The Rochdale envelope enables and facilitates a degree of flexibility within the project design at consent. Planning Inspectorate Advice Note Nine: Rochdale Envelope states "*The need for flexibility is identified in a number of National Policy Statements (NPS) which suggest the Rochdale Envelope as an approach to address uncertainties inherent to the Proposed Development e.g., changing market conditions. However, Energy (EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and the NPS for National Networks all stress the need to ensure that the significant effects of a Proposed Development have been properly assessed"* (paragraph 1.3).
BEIS (Department for Business, Energy and	The BEIS (now Department for Energy Security and Net Zero (DESNZ)) Energy White Paper (2020) sets out how the UK will clean up its energy system and

Legislation, policy & guidance	Details
Industrial Strategy) Energy White Paper	reach net zero emissions by 2050, reiterating the UK Government target of achieving 50GW of offshore wind by 2030, of which North Falls could make a significant contribution (see ES Chapter 2 Need for the Project (Document Reference: 3.1.4)). Seeking the appropriate balance between environmental, social and economic costs is a key component of the white paper.
Marine Policy Statement	The Marine Policy Statement (MPS) adopted by all UK administrations in March 2011 provides the policy framework for the preparation of marine plans, establishing how decisions affecting the marine area should be made in order to enable sustainable development.
East Marine Plans	The approach taken to offshore wind renewable energy infrastructure and subsea cabling outlined in the plan and associated policies. With specific reference to subsea cabling, engagement has been undertaken to understand potential impacts on navigation lanes and deep water channels, with the offshore cable corridor subsequently adapted to minimise impact.
The Crown Estate's Cable Route Protocol	The Cable Route Protocol comprises a set of principles and requirements for offshore wind developers in the planning of offshore export cable routes. Compliance with these principles and requirements is secured within the offshore array Agreement for Lease (AfL). Compliance with these requirements must be demonstrated within the Corridor Identification and Approval for Linear Activities (CIAL) document which will accompany an application to The Crown Estate for a transmission assets AfL.
National Planning Policy Framework (NPPF)	The NPPF does not contain specific policies for NSIPs (for which particular considerations apply, determined in accordance with the decision-making framework set out in the Planning Act 2008 and relevant NPSs) but may be considered as a relevant and important matter.
Local Policy	
Tendring District Local Development Plan	Tendring District Local Plan 2013-2033 and Beyond: North Essex Authorities' Shared Strategic Section 1 was formally adopted in January 2021, with Section 2 – which contains the Tendring-specific polices – formally adopted in January 2022. The Local Plan sets out the local planning polices which are a material consideration during the assessment of development proposals. These proposals sit within the framework of national planning policies set out the NPPF.
Guidance	
EIA Guide to Shaping Quality Development (Institute of Environmental Management and Assessment (IEMA))	IEMA's EIA Guide to Shaping Quality Development states that considering the key environmental and consenting risks alongside the engineering requirements of a project can influence design in many ways. The earlier the interaction commences, the more likely it is that cost effective, positive outcomes will be achievable. This can be considered in several ways: • The review of site selection of alternative development sites to avoid key sensitive receptors; • Alternating the layout to work within a site's existing natural systems; • Amending the design of a specific aspect of the development to manage impacts; • Specifying construction techniques to avoid effects on receptors; and

Legislation, policy & guidance	Details
	• Changing materials to reduce volume and / or transport impacts.
The Horlock Rules	In order to identify the most appropriate location to site the onshore substation, national grid's Guidelines on Substation Siting and Design ('The Horlock Rules') (National Grid Company (NGC), 2006) are considered. These guidelines document national grid's best practice for the consideration of relevant constraints associated with the siting of onshore substations.
The Holford Rules	National grid employs the Guidelines on overhead line routing. Since the formulation of the original Rules, formal requirements for environmental assessment have been introduced. Whilst environmental assessment for overhead lines addresses wider topics than the visual amenity issue on which the Rules concentrate, they remain a valuable tool in the selecting and assessing potential route options as part of the environmental assessment process. While there will be no overhead lines in the North Falls design envelope, the Holford Rules provide the context for the national grid connection point. They also inform the North Falls project decision to select buried rather than overhead cables.

4.1.2 Key components of North Falls

5. North Falls comprises the following main offshore areas and components:

- Array area which would encompass:
  - Wind turbines and their associated foundations;
  - Offshore substation platform(s) (OSP(s)) and / or offshore converter platform (OCP) (see Section 4.3); and
  - Array cables and cable protection.
- Offshore cable corridor (see Section 4.3), which would encompass:
  - Offshore export cables and cable protection.

6. The main onshore areas and components of North Falls comprise:

- Landfall, where the offshore export cables are brought ashore;
- Onshore cable route, where the onshore export cables take the electricity from landfall to the onshore substation;
- Onshore substation works area, where all temporary and permanent works associated within the onshore substation are located, including onshore substation, construction compound, access, landscaping, drainage and earthworks; and
- National grid connection point, where the Project will connect into the national grid.

4.1.3 Site selection process

7. The siting, design and refinement of the North Falls offshore and onshore project areas has followed a site selection process, taking account of

environmental, physical, economic and social effects and opportunities, as well as engineering, technical and commercial feasibility. The details of the approach taken to select the array area; offshore cable corridor; landfall; onshore cable route and onshore substation works area are provided in Sections 4.4 to 4.9. The aim was to identify project areas that would be environmentally acceptable, deliverable and consentable, whilst also enabling, in the long term, the benefits of being economic and efficient.

8. A multi-disciplinary design team was formed to undertake the site selection process, which included a team of specialists comprising engineers, planners, land advisors, landscape architects, legal and EIA consultants.

4.1.4 Overview

9. The site selection process commenced with the identification of an extension to the existing GGOW in 2019 (discussed further in Section 4.4). National Grid Electricity Transmission (NGET) subsequently advised that the grid connection search area was in the region of the Tendring Peninsula (Section 4.5), which enabled a site selection process to be undertaken to identify a landfall search area (discussed in Section 4.6), and subsequent identification of the offshore cable corridor to connect the North Falls array areas and landfall search area (Section 4.7).

10. Following a network review, NGET provided confirmation that the grid connection location for North Falls would be at a location in the vicinity of Ardleigh, to the north-west of Tendring Peninsula between Colchester and Manningtree. This enabled the site selection process for the onshore substation location (Section 4.8) and onshore cable route (Section 4.9).

11. The project areas described in Section 4.1.2 have been significantly refined throughout the pre-application process, in response to consultation (Section 4.2 and ES Appendix 4.2 (Document Reference: 3.3.1.2)), as well as environmental and engineering studies.

12. At scoping stage an “onshore scoping area” was considered, which was subsequently refined to a landfall search area, onshore cable corridors and an onshore substation zone in the Preliminary Environmental Information Report (PEIR), before being further refined to the onshore areas outlined above.

13. For the offshore project area, the Scoping Report and PEIR included two array areas and an interconnector corridor. Following stakeholder feedback on the PEIR, the offshore project area has been revised, with the previously defined northern array area and interconnector corridor removed. The southern array area (now the ‘array area’) has also been reduced in size and the offshore cable corridor has been extended to meet the revised boundary of the array area. The offshore cable corridor was also reduced in width to align with the selected landfall.

14. Plate 4.1 provides an overview of the North Falls site selection process. While Plate 4.1 depicts the site selection process as being linear, in reality, the North Falls site selection process has been an iterative process undertaken and informed by the Project’s ongoing EIA studies and consultation, with decisions being made in consideration of multiple factors from different disciplines

(including onshore and offshore) in parallel, throughout the site selection process.

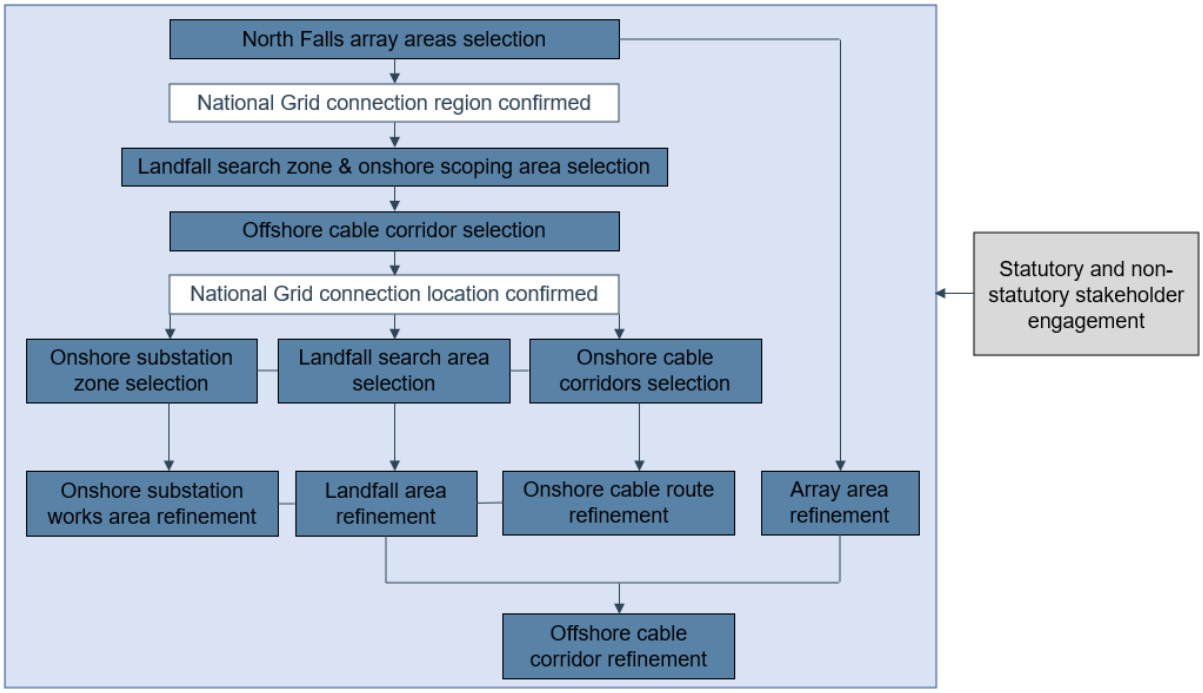

Plate 4.1 Overview of the North Falls site selection process

15. The Project's site selection process was underpinned by a set of 'golden rules'. These are a set of assumptions and principles which set the framework for the site selection exercise, and which will be adhered to throughout the process. Whilst an extensive range of other environmental and technical parameters have also been considered during site selection, the golden rules represent the starting point for identifying viable options for the location of infrastructure. They are not an exhaustive list of the constraints considered, as these vary depending on the infrastructure element and were updated as the site selection progressed. Rather the golden rules serve as a starting point for the process to ensure there was a common set of rules which underpin the different studies and assessments which comprise the North Falls site selection process.

16. The golden rules have been derived using best practice guide for site selection, including The Crown Estate's Cable Route Protocol, the national grid's Horlock Rules (for the siting of substations) and Holford Rules (for the siting of transmission infrastructure), as well as NPS EN-1, EN-3 and EN-5 and other relevant planning considerations.

17. The golden rules are presented in ES Appendix 4.1 (Document Reference: 3.3.1.1).

4.1.5 Collaboration with other projects

18. As discussed in Section 4.1.4, NGET has provided NFOW with a grid connection location for North Falls at the proposed East Anglian Connection Node (EACN) substation in the vicinity of Ardleigh, Essex. As discussed in ES Chapter 1 Introduction (Document Reference: 3.1.3), NFOW is committed to

working with the DESNZ to explore grid connection options and as such, NFOW has co-operated with the Offshore Transmission Network Review (OTNR) process. In addition, NFOW has applied to the Offshore Coordination Support Scheme (OCSS) in consortium with NGET and Five Estuaries Offshore Wind Farm Limited (VEOWL) for an offshore connection to Sea Link, a marine cable between Suffolk and Kent proposed by NGET as part of their Great Grid Upgrade. Therefore the following grid connection options are included in the Project design envelope (discussed further in ES Chapter 5 Project Description (Document Reference: 3.1.7)):

- Option 1: Onshore electrical connection at a national grid connection point within the Tendring peninsula of Essex, with a project alone onshore cable route and onshore substation infrastructure;
- Option 2: Onshore electrical connection at a national grid connection point within the Tendring peninsula of Essex, sharing an onshore cable route and onshore cable duct installation (but with separate onshore export cables) and co-locating separate project onshore substation infrastructure with Five Estuaries Offshore Wind Farm ('Five Estuaries'); or
- Option 3: Offshore electrical connection, supplied by a third party.

19. The site selection process takes into account all three options.

20. The site selection process for the transmission infrastructure required under both Options 1 and 2 has involved co-ordination with the Five Estuaries project – a proposed extension to the existing Galloper Offshore Wind Farm (GWF), located to the east of North Falls and adjacent to the existing GWF – and the transmission infrastructure for both options has been designed as a single site selection process. As such, although Option 1 considers North Falls infrastructure in isolation, if it is constructed, efficiencies arising from co-locating infrastructure with Five Estuaries through co-ordinated site selection will still have been realised. A full description of the options is set out in ES Chapter 5 Project Description (Document Reference: 3.1.7).

21. The details of how co-ordination between North Falls and Five Estuaries has been undertaken during the Project's site selection process is set out in Sections 4.8 and 4.9, and full details are provided in the project Co-ordination Report (Document Reference: 2.5).

22. Option 3 would include the offshore array area discussed in Section 4.4. The transmission infrastructure described in Sections 4.5 to 4.9 would not be required.

4.2 Consultation

23. The Applicant has undertaken pre-application engagement with stakeholders, communities and landowners throughout the site selection process, in order to seek input to the process, as well as to communicate key project updates. The golden rules were extensively shared with statutory stakeholders, either during Expert Topic Groups (ETG) or during dedicated sessions.

24. The key consultation to date relating to site selection and assessment of alternatives is summarised in ES Appendix 4.2 (Document Reference: 3.3.1.2).

The feedback received has been considered in refining the project location and design. ES Appendix 4.2 (Document Reference: 3.3.1.2) also provides a summary of how the consultation responses received to date have influenced the approach that has been taken.

25. Further details of the consultation process are presented in the Consultation Report that forms part of the Development Consent Order (DCO) application (Document Reference: 4.1).

4.3 Project alternatives

26. A number of strategic-level project location and design alternatives have been considered as part of the site selection and assessment of alternatives process, shown in Table 4.2.

Table 4.2 Alternatives considered

Alternatives considered	Considerations	Conclusions
Non-radial export options	As discussed in Section 4.1.1, NPS EN-1 requires a co-ordinated approach to electricity transmission to be considered.	NFOW has reviewed the possibility for radial and non-radial options for exporting electricity from the array areas. These options are discussed in more detail in Section 4.1.5.
Landfall near Sizewell and associated offshore cable corridor	Cable route passed close to Orford Inshore Marine Conservation Zone (MCZ) and through the Outer Thames Estuary Special Protection Area (SPA) providing comparable environmental constraints to the selected cable route. Landfall zone in the Sizewell area is highly constrained by existing GGOW and GWF) export cables, East Anglia ONE North and TWO (now consented) export cables, Sizewell A and B nuclear power stations and a large geological feature driving the local coastal processes. Onshore cable routes were also constrained by existing and planned infrastructure. Substation location options were also constrained by the Suffolk Coast and Heaths Area of Outstanding Natural Beauty, villages and proposed substations for East Anglia ONE North and TWO and the existing and proposed nuclear power station works.	Taking account of the various constraints, NGET moved the grid offer away from this region and instead to the Tendring Peninsula.
Alternative landfall options within the Tendring Peninsula	A site selection study was undertaken in February 2021 to identify the optimum landfall location along the Tendring peninsula. This exercise included a review of eight options between Harwich and Jaywick on the Tendring coast. Through a process of engineering and environmental review, this was narrowed down to three options, which form the	A landfall location at 'Kirby Brook', also suitable for bringing ashore cables for Five Estuaries, has been selected. The precise land compound / drill location will be defined during detailed design.

Alternatives considered	Considerations	Conclusions
	basis of the landfall search area assessed within the PEIR. These three options were reviewed in more detail during a site selection exercise in December 2022, which determined that two of the options ('Kirby Brook' and 'Holland Brook') would be suitable landfall locations for North Falls alone. The outcomes of the site selection work undertaken identified the most suitable option for bring ashore cables for both the North Falls and Five Estuaries projects. This process concluded the Kirby Brook, was the most suitable option, and this option has been taken forward within the DCO application. The alternative options are discussed in more detail in Section 4.6.	
A range of offshore cable corridor options to the Tendring Peninsula	Section 4.7 describes the analysis of offshore cable corridor options, in consultation with key stakeholders.	The current offshore cable corridor was selected to seek to minimise interaction with environmental designated sites and interaction with shipping routes and dredging associated with Harwich Haven Authority.
Alternative onshore substation options	The site selection exercise described in Section 4.8 identified an initial 16 options for the location of the Project's onshore substation within 3km of the grid connection point for the Project indicated by NGET in January 2021. These options were reviewed and assessed in order to identify a single preferred area in which the Project's onshore substation is proposed to be located, which form the basis of the onshore substation zone assessed within the PEIR. An extensive list of environmental, engineering, planning and land criteria were used in defining the onshore substation zone presented within the PEIR. NFOW and VEOWL have undertaken a further study to identify preferred options for co-located onshore substations within the onshore substation zone. This study has considered alternative orientations of the North Falls and Five Estuaries onshore substation footprints, and has identified a solution which reduce the potential impacts on nearby receptors for a solution that allows for either a build	An onshore substation location is proposed approximately 2km to the east of the village of Ardleigh, and has been designed to allow for the construction of either North Falls alone or co-located onshore substations with Five Estuaries at this location. A wider onshore substation works area, where access, drainage, landscaping, environmental mitigation and ancillary works will be located has also been defined. A decision to select an option for co-locating North Falls and Five Estuaries onshore substations has been undertaken to reduce cumulative effects associated with both projects.

Alternatives considered	Considerations	Conclusions
	out of a single project, or co-located project substations.	
Alternative onshore cable corridor(s) options	The site selection exercise described in Section 4.9 identified a number of alternative onshore cable corridor(s) options for connecting the landfall search area to the onshore substation, including: • Seven 400m-wide 'southern' options and three 400m-wide 'northern' options; • Five alternative refined 204m wide onshore cable corridor(s) connecting the landfall search area to the A120; • Three alternative 204m-wide onshore cable corridor(s) connecting the A120 to the onshore substation zone; and • Three alternative 204m-wide onshore cable corridor(s) options around Thorpe-le-Soken. These options were reviewed and assessed in order to identify as far as possible an initial single preferred 204m-wide onshore cable corridor(s), as assessed within PEIR. An extensive list of environmental, engineering, planning and land criteria were used in defining the onshore cable corridor(s). NFOW and VEOWL have undertaken a further study to identify an onshore cable route which could accommodate the onshore export cables required to connect the offshore export cables to the North Falls and Five Estuaries onshore substations. This study has considered alternative corridor options such as routing the onshore export cables closer to Hamford Water; and routing cables east closer to Great Holland when crossing Little Clacton Road, and has identified a solution which reduces the likely significant effects on nearby receptors for a solution that allows for either a build out of a single project, or co-located project export cables.	A single 72 - 130m wide onshore cable route, suitable for installing onshore export cables for North Falls and Five Estuaries has been defined.
Overhead lines along the onshore cable route from	Overhead lines were considered as an alternative option to buried cables for routing onshore export cables from	The environmental benefit of burying cables as opposed to overhead lines and pylons is a

Alternatives considered	Considerations	Conclusions
landfall to onshore substation	landfall to the Project's onshore substation. The key considerations in regard to this decision were: • The potential visual impacts associated with above ground overhead lines; and • The potential environmental effects associated with above ground infrastructure versus buried, below ground infrastructure.	significant reduction of permanent visual impacts, therefore buried cabling was selected.
Cable installation technique (onshore)	Alternative methods of cable duct installation within the onshore cable corridor(s) have been considered. NFOW have considered that in order to keep the onshore cable corridor(s) as narrow as practicable, open cut trenching is the preferred method for duct installation for the onshore export cables. However, a review of obstacles along the route has been undertaken and, where sufficient engineering certainty is known at this stage to commit to specific duct installation techniques, alternative 'trenchless' techniques have been selected for duct installation in order to avoid certain obstacles or mitigate the potential impacts on certain receptors. Obstacles and receptors have been identified through engineering design and the EIA process, and include watercourses, major and selected sensitive minor roads, railway lines, designated sites for nature conservation, woodland UK Habitat of Principal Importance, and sensitive hedgerows. The proposed crossing schedule, including details of which techniques are proposed for obstacles and receptors identified along the route, can be seen in ES Appendix 5.1 (Document Reference: 3.3.2).	Open cut trenching is used as the primary installation technique, with trenchless techniques (e.g. Horizontal Directional Drilling (HDD)), to be used preferentially at certain obstacles and receptors. The techniques which are proposed to be used for each obstacle and receptor identified along the route can be seen in ES Appendix 5.1 (Document Reference: 3.3.2).
Gas Insulated Switchgear (GIS)	Consideration was given to the insulation system to be used for the electrical infrastructure at the onshore substation. GIS uses Sulphur Hexafluoride (SF_6) which is a greenhouse gas.	Air Insulated Switchgear (AIS), which does not require the use of SF_6, has been selected.
Construction access to the onshore substation	Due to the location of the Project's national grid connection point at NGET's EACN substation (see section 4.5), and the need for the onshore substation to be located proximal to that, there is at least	Routing construction traffic from Bentley Road, then turning off onto the onshore cable route and utilising the off-road haul route was

Alternatives considered	Considerations	Conclusions
	3km between the Strategic Road Network (SRN) and the onshore substation at the nearest point. Alternative options for accessing the onshore substation during construction were considered, including routing vehicles along the local road network via Little Bromley, Great Bromley, Ardleigh or Lawford. In order to minimise effects on local communities, an alternative option involving routing construction traffic from Bentley Road, then turning off onto the onshore cable route and utilising the off-road haul route for approximately 3km was proposed.	selected to avoid impacts upon local communities as far practicable.
Scale of array area	As discussed in Section 4.4, the boundary of the array area has been significantly refined during the pre-application stage of the Project.	Following PEIR, reductions were made in response to stakeholder feedback and the revised boundary is shown in ES Figure 4.3 (Document Reference: 3.2.2).
Wind turbine sizes and number of turbines	A range of wind turbine sizes have been considered to encompass those currently on the market as well as future potential turbine sizes.	The size of turbines consistently available on the market has increased during the pre-application stage of North Falls and therefore the size range included in the Project Design Envelope has been refined (i.e. the smallest turbines included at Scoping and PEIR stage have been removed from the envelope). The turbines sizes are discussed further in ES Chapter 5 Project Description (Document Reference: 3.1.7).
Wind turbine air gap	A range of air gaps between the rotor tip at its lowest point and the water surface have been considered, specifically with regards to ornithology collision risk, with increased air gap typically reducing collision risk.	The minimum air gap included in the Project design envelope is 27m above mean high water springs. This reflects the expected height of the turbines likely to be available at the time of installation, and the capability of the largest installation vessels on the market currently.

4.4 Identification of the North Falls array area

4.4.1 Extension leasing round

27. As discussed in Section 4.1, North Falls is an extension to the GGOW (shown in ES Figures 4.1 to 4.3 (Document Reference: 3.2.2)), which is located off the coast of Suffolk, England and was commissioned in 2012. NFOW and Greater Gabbard Offshore Winds Limited (GGOWL) are joint ventures between SSE Renewables Offshore Windfarm Holdings Limited (SSER) and RWE Renewables UK Swindon Limited (RWE).

28. In February 2017, The Crown Estate launched an opportunity for owners of existing wind farms to apply for project extensions and NFOW was one of a number of developers that applied for an AfL to develop an extension to an existing OWF.

29. The AfL applications identified areas of interest for each of the proposed extension OWFs. Consultation was undertaken by The Crown Estate which led to the refinement of the North Falls array areas from that shown in ES Figure 4.1 to the former array areas shown in ES Figure 4.2 (Document Reference: 3.2.2).

30. Subsequently, The Crown Estate undertook a plan level Habitats Regulations Assessment (HRA) of all the OWF extension applications received (The Crown Estate, 2019). The plan-level HRA ascertained that the plan could proceed including North Falls (formerly 'Greater Gabbard Extension'). NFOW was awarded seabed rights by The Crown Estate in August 2019 to progress the extension and seek planning consent.

31. Key criteria set by The Crown Estate's extension process which influenced the site selection process of the North Falls array areas, included the fact that wind farm extensions must share a boundary with the existing (parent) wind farm; and that the proposed wind farm to be extended must be constructed and fully operational at the date of the application.

32. GGOW was previously extended from its eastern boundary by GWF (shown in ES Figure 4.1 to 4.3 (Document Reference: 3.2.2), which has been operational since 2018. The starting point for the North Falls array areas selection was therefore that it had to be an extension to the north, west and / or south of GGOW, taking into account a range of existing constraints, discussed further below.

4.4.2 Principles for the array area selection

33. In addition to the existing wind farms, the following constraints were considered during the site selection process:

- International Maritime Organisation (IMO) traffic routing schemes;
- Aggregate dredging grounds;
- Harbour approach channel dredging areas;
- Disposal sites;
- Anchorage areas;
- Military areas;
- Cables;
- Pipelines;
- Nature conservation designations;
- Oil and gas infrastructure;
- Wind resource;

- Metocean data; and
- Bathymetry and predicted ground conditions.

4.4.3 Former array areas at Scoping and PEIR stage

34. The former northern array area of North Falls was primarily defined by the following constraints (shown in ES Figure 4.2 (Document Reference; 3.2.2)):
    - The GGOW boundary to the south;
    - The GGOW and GWF existing cables to the north-east;
    - An aggregate production area to the north-west; and
    - The Traffic Separation Scheme (TSS) to the west and south of the northern array area.
35. The former southern array area was defined by the following constraints (ES Figure 4.2 (Document Reference: 3.2.2)):
    - The GGOW and GWF boundaries to the east;
    - TSS to the north and west; and
    - Aggregate production area to the south.
36. The array areas were designed to maximise capacity within the various constraints outlined above. In order to achieve this objective, an AfL with an area of 150km^2 was sought from The Crown Estate.

4.4.4 North Falls array area

37. Following stakeholder feedback received through the Evidence Plan Process and shipping stakeholder engagement (see Section 4.2 and ES Appendix 4.2 (Document Reference: 3.3.1.2)), the array area has been significantly reduced:
    - The former northern array area has been removed to reduce impacts on shipping and seascape, particularly the Suffolk and Essex Coast and Heaths National Landscape[1].
    - The southern array area (now the 'array area') has been reduced in size to facilitate:
        - An increased buffer from the IMO TSS lanes (discussed further in ES Chapter 15 Shipping and Navigation (Document Reference: 3.1.17));
        - No overlap with the IMO Precautionary area (discussed further in ES Chapter 15 Shipping and Navigation (Document Reference: 3.1.17));
        - Increased buffer from the Outer Thames Estuary SPA (discussed further in the ES Chapter 13 Offshore Ornithology (Document Reference: 3.1.15); and

[1] Formerly the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB)

- No overlap with the Kentish Knock East (KKE) MCZ.

38. The array area has been reduced from 150km^2 to 95km^2. The maximum number of turbines has therefore also reduced since the PEIR to 57 of the smallest turbines (down from 72); or 34 of the largest turbines in the design envelope (down from 40). Turbine sizes are discussed further in ES Chapter 5 Project Description (Document Reference: 3.1.7).

39. This size of the array area represents a balance between delivering the capacity of North Falls, ensuring commercial viability, and reducing environmental effects. Delivery of North Falls is important in reaching UK Government renewable energy and climate change targets, discussed further in ES Chapter 2 Need for the Project (Document Reference: 3.1.4) and ES Chapter 3 Policy and Legislative Context (Document Reference: 3.1.5).

4.5 Onshore grid connection

40. The site selection process for the Project's transmission infrastructure under Options 1 and 2 is driven by the grid connection point offered to the Project by NGET.

41. NGET is responsible for operating the electricity transmission network in England and Wales. The Connection and Infrastructure Options Note (CION) process is the mechanism used by NGET to evaluate potential transmission options for generation projects to identify a suitable connection point, in line with their obligation to develop and maintain an efficient, coordinated and economic electricity transmission network. As part of the economic assessment, the CION considers the total life cost of the connection; assessing both the capital and projected operational costs to the onshore network (over a project's lifetime) to determine the most economic and efficient design option.

42. The CION process for North Falls commenced in March 2019 and in January 2021 NGET indicated to NFOW that the location of the connection would be at a new 'East Anglia Coastal' substation, and the location of that new substation will be within the Tendring Peninsula. In April 2021 NGET provided NFOW with a draft CION offer for connection at the new East Anglia Coastal substation however no confirmed location for the new substation was provided within the CION offer. Subsequently, NGET provided increased certainty to NFOW that the new substation would be located in land east of the village of Ardleigh in Tendring district, Essex (see ES Figure 4.12 (Document Reference: 3.2.2)). NFOW have used this information as the basis of the site selection process for North Falls.

43. Since 2021, NGET have developed proposals for the EACN substation as part of their Norwich to Tilbury grid reinforcement project (formerly 'East Anglia Green Energy Enablement (GREEN)') for upgrading the grid infrastructure within East Anglia. The Norwich to Tilbury project is proposed to facilitate the transfer of power from the East Anglia region to the rest of the network thereby enabling connection of offshore wind generation, nuclear power generation and interconnectors which are expected into East Anglia by 2035.

44. NGET published a Scoping Report for the project in November 2022, which detailed proposals for a new substation to be located due north of the existing

Lawford substation, east of the village of Ardleigh. In April 2024, NGET published its PEIR documentation for the Norwich to Tilbury project, which presented a footprint for the proposed new EACN substation located within the area adjacent to the North Falls onshore substation works area (see *Norwich to Tilbury - Consultation Plans - Section C* (2024)) and within the Order limits for the Project to facilitate connection works into the new EACN substation. This is the location at which North Falls will connect to the grid under grid connection Options 1 and 2.

4.6 Identification of the landfall

4.6.1 Identification of a landfall search area

45. The first step in identifying suitable locations for the Project's transmission infrastructure is to identify a location where offshore export cables can be brought ashore (i.e. the cable landfall).

46. To determine the optimum location for cable landfall, the Project needs to be in possession of information regarding the location in which it will be able to connect into the national grid. Following NGETs indication in January 2021 that the Project will connect into a new substation located within the Tendring peninsula, North Falls commissioned a study to identify suitable locations for making cable landfall on the Tendring peninsula between the Stour and Colne Estuaries.

47. An initial desk-based exercise was undertaken to identify potential landfall locations along the Tendring coastline. As a first step, the study sought to identify broad areas in which cable landfall could be undertaken. International sites for nature conservation (European and Ramsar sites) and built-up areas on the coastline were removed from the search area. Once these constraints were removed, three areas along the Tendring district coastline were identified as providing potentially suitable locations for bringing cables ashore (see ES Figure 4.4 (Document Reference: 3.2.2)):

- Dovercourt;
- Frinton-on-Sea to Clacton-on-Sea; and
- Jaywick.

48. These three options were then subject to a desk-based engineering and environmental review to identify key technical feasibility and environmental constraints associated with each. The key findings are summarised below.

4.6.1.1 Dovercourt

49. Located immediately south of Harwich, this landfall location comes ashore in proximity to Hamford Water SPA and busy shipping channels. Onshore, the area would overlap with a potential historic landfill.

4.6.1.2 Frinton-on-Sea to Clacton-on-Sea

50. This location has the capacity for multiple possible landfall locations along its length and is relatively unconstrained offshore. The key constraint of this option is the presence of Holland Haven Marshes Site of Special Scientific Interest (SSSI) and Local Nature Reserve (LNR) across its length, immediately seaward

of an existing sea wall. This designation could be crossed effectively by the use of HDD to install cables at the landfall (discussed further in ES Chapter 5, Project Description (Document Reference: 3.1.7)).

4.6.1.3 Jaywick

51. To reach this option offshore export cables would need to route through Blackwater, Crouch, Roach and Colne Estuaries MCZ. Once onshore, the Clacton Cliffs and Foreshore geological SSSI would need to be crossed, although this could be crossed effectively by the use of HDD to install cables at the landfall. This option is narrow and constrained by residential properties on both sides.

52. Through comparative assessment, the Frinton-on-Sea to Clacton-on-Sea area was identified as the least constrained landfall location and was taken forward as the landfall search area for further assessment. The landfall search area was then assessed within the PEIR.

4.6.2 Selection of the landfall

53. Since the confirmation of a grid connection location by NGET and publication of the PEIR, a further site exercise has been undertaken to identify potential landfall compound locations (and associated HDD profiles) within the landfall search area, and compare the constraints and opportunities associated with each. Three options – Chevaux de Frise, Kirby Brook and Holland Brook – were identified as locations where landfall works would be viable along the coastline between Clacton-on-Sea and Frinton-on-Sea (see ES Figure 4.5 (Document Reference: 3.2.2)). A further desk-based engineering and environmental review of these three options to identify key technical feasibility and environmental constraints associated with each.

4.6.2.1 Chevaux de Frise

54. The southernmost of the three options, is located adjacent to the wetland habitat of the Holland Haven Marshes SSSI and LNR. Unique constraints were identified with this option when compared with others, including proximity to key ornithological features associated with Holland Haven Marshes SSSI and LNR, the need for >500m HDD to reach the beach, notable slopes in compound location, and sheet piles present in the drill profile.

4.6.2.2 Kirby Brook

55. The central of the three options, a compound here would be located with a field within the former estuary area but outside the SSSI. A wide range of drill profiles are available with this option. No unique significant constraints not shared by the other options were identified; although risks presented by this option include uncertainty regarding the nature of the geology and low-lying land at the landfall compound location.

4.6.2.3 Holland Brook

56. The northernmost of the three options, located landward of Frinton Golf Course on land rising away from the coastline. No unique significant constraints not shared by the other options were identified; although challenges presented by this option include further separation from access points, and constraints on the incoming offshore cable route space for multiple projects to use this option.

57. Following the completion of this site selection exercise, it was concluded that Kirby Brook and Holland Brook were both viable options with comparable engineering, environmental and land constraints and opportunities for siting a project landfall.

58. The outcome of the site selection work undertaken to date was reviewed to identify the most suitable option for bringing ashore cables for both the North Falls and Five Estuaries projects at a single onshore location. This process involved putting significant weight against options which would enable compliance with the revised EN-5 (DESNZ, 2023c) by facilitating co-ordination between North Falls and Five Estuaries. Landfall options that would have sufficient capacity to accommodate onshore landfall works (i.e. HDD and associated temporary works) for both North Falls and Five Estuaries were therefore given additional weight in the decision process.

59. Of the two options under consideration, Kirby Brook was the most suitable option due to the greater availability of space for incoming offshore cable routes for two projects (and four circuits) to make landfall at this location, and this option has been taken forward within the DCO application (see ES Figure 4.6 (Document Reference: 3.2.2)).

4.7 Offshore cable corridor site selection

60. Following agreement of the wind farm array areas with The Crown Estate (Section 4.4), and identification of the grid connection search area (Section 4.5) and the corresponding landfall search area (Section 4.6), NFOW undertook site selection of the offshore cable corridor.

61. The first stage of the site selection exercise was to identify a broad 'area of search', in accordance with The Crown Estate's Cable Route Protocol (2019), in which the offshore cable corridor could be located to join the array areas to the landfall search area (ES Figure 4.7 (Document Reference: 3.2.2)).

62. The following hard constraints were then discounted from the area of search (ES Figure 4.8 (Document Reference: 3.2.2)):

- Anchorages;
- Dredging areas; and
- Dumping grounds.

63. NFOW then sought to identify a number of offshore cable corridor options based on the following key principles:

- Selection of the most direct route from array to preferred landfall search area, in balance with the other key principles;
- Space for the following export cable parameters:
    - The offshore cable corridor width is 1km to accommodate;
        - Four export cable circuits;
        - Minimum spacing of 50m and an optimum spacing of 200m between export cable circuits. This spacing is based on ensuring

there is enough space for installation and future repair if needed, as well as ensuring sufficient spacing to avoid thermal issues;

- Sufficient room to micro-site around possible seabed obstructions identified during the EIA and pre-construction surveys;

- Avoid or minimise direct impact to designated environmental sites where practicable, in accordance with The Crown Estate's cable route protocol;
- Minimise impact on other sea users and navigational safety;
- Avoid routing through significant sandbank features (i.e. Margate and Long Sands Special Area of Conservation (SAC) or KKE MCZ) where a practicable alternative exists;
- Avoid routing through licensed aggregate dredging areas, disposal sites, explosives dumping grounds and anchorages, in accordance with the hard constraints removed from the area of search;
- Avoid routing through offshore oil and gas sites subject to a lease agreement with The Crown Estate, to include offshore fields and infrastructure (including pipelines and offshore platforms);
- Avoid locations, including wrecks, known to be of archaeological importance where practicable;
- Avoid routing within the offshore array development boundaries of existing operational offshore project areas and those currently in planning or under construction;
- Minimise the number of subsea cable / pipeline crossings required; and
- Consider options that could minimise the cable infrastructure 'footprint' by working with other known developers who may be considering a similar route (subject to being able to make realistic assumptions about other developers' proposals).

64. Northern, central and southern offshore cable corridor options between the array areas and landfall search area were identified by NFOW, following constraints mapping. Both of the north and south cable corridor options, also had two spurs where the export cables could leave the array areas, providing five options in total (North A, North B, Central, South A and South B; shown in ES Figure 4.9 (Document Reference: 3.2.2). These options were then issued to key nature conservation, shipping and navigation stakeholders, the Ministry of Defence (MoD) and Historic England (Section 4.1.5) in accordance with The Crown Estate's cable route protocol and order to obtain feedback on each option.

65. Key consultee feedback included a recommendation to entirely avoid the Margate and Long Sands SAC and the KKE MCZ (i.e. the central and southern route options). This directed NFOW towards the northern corridor options, however issues with the northern corridors were raised by the shipping and navigation stakeholders and so this was subject to further evaluation and direct shipping consultation.

66. The additional consultation with shipping and navigation stakeholders led to further refinement of the North B offshore cable corridor to avoid specific areas of consistent heavy traffic routing for Ultra Large Container Vessels. This resulted in the final offshore cable corridor ('North C'), shown in ES Figure 4.10 (Document Reference: 3.2.2).

67. The proposed offshore cable corridor begins at the north-west corner of the array area and crosses the main Sunk TSS south shipping channel at an angle as close as practicable to perpendicular, to reduce disruption to the TSS.

68. The corridor then turns north, running outside yet adjacent to the Margate and Long Sands SAC and routes between two areas of the Outer Thames Estuary SPA boundary, as to the extent this was practicable. After rounding the tip of the SAC, the corridor remains as far south as practicable to minimise interaction with an IMO 'Area to be Avoided' in the centre of the Sunk Outer precautionary area, as well as avoiding overlap with anchorage areas and a dredging channel for the approaches to Harwich Haven port.

69. Further to the west, the corridor moves slightly to the north to route around disposal sites and an anchorage area, while keeping south of the Harwich Ultra Large Container Vessel channel. After rounding the tip of the disposal site, the cable corridor routes south-west to the landfall search area, minimising overlap with areas of shallow water which represent engineering challenges to access with cable installation vessels. The cable corridor then turns to head to the landfall search area, crossing the shallow water in the most direct route practicable.

70. Following PEIR and the refinement to the array area (Section 4.4.4) and landfall (Section 4.6.2), the offshore cable corridor has been refined slightly to align with the array area and landfall (shown in ES Figure 4.11(Document Reference: 3.2.2)).

71. In addition, following removal of the former northern array area, an interconnector cable between the northern and southern array areas was also removed.

72. Following PEIR, the number of export cable circuits has reduced from four to two, however the 1km wide offshore cable corridor is required to facilitate a future dedicated cable route exercise for each export cable circuit. Detailed cable routes within the offshore cable corridor will be defined following an intrusive geotechnical campaign, invested in and executed post DCO, along the offshore cable corridor. This presents the future opportunity to increase separation from sensitive constraints, including shipping routes and environmental receptors.

4.8 Onshore substation

73. Following the provision of a grid connection location by NGET, NFOW has undertaken a site selection exercise to identify the optimum location for an onshore substation.

74. As outlined in Section 4.1.5, NFOW has sought to identify suitable options for the Project's onshore infrastructure that can accommodate either the North Falls project alone or co-located infrastructure for North Falls and the Five Estuaries

project. The onshore substation site selection exercise has therefore, from the outset, sought to identify options which would fulfil the objectives of both projects.

75. The site selection exercise has sought to identify the most "*economical and efficient*" option, as described in Section 9 of the Electricity Act 1989, by taking into account, "*the environmental, social and economic effects and including, where relevant, technical and commercial feasibility*" as set out in the NPS EN-1 (DESNZ, 2023a). The requirements are articulated in more detail in Schedule 9 of the Electricity Act 1989, which places a duty on all licence holders, to "*have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and … do what [they] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.*"

76. The onshore substation site selection exercise undertaken was multi-disciplinary, iterative and consultative, seeking to ensure a breadth of information was used to inform the identification of locations for the Project's infrastructure.

4.8.1 Area of search

77. The first stage of the site selection exercise was, as described in The Crown Estate's Cable Route Protocol (2019)[2], to identify a broad 'area of search' in which the Project's onshore substation could be located. This area of search was defined by taking into account initial high level technical feasibility and environmental parameters in order to identify an area in which the onshore substation could potentially be located.

78. In order to delineate an area of search, the following principles were applied:

- All land within 3km of the Project's grid connection point (located approximately 2km east of the village of Ardleigh, see Section 4.5) was considered[3];
- From this 3km search area, the following high-level constraints were applied:
    - Excluding all land more than 20km of the landfall search area[4];

[2] Note that although the Cable Route Protocol was devised to provide a framework for the identification of offshore transmission infrastructure, The Crown Estate's Cable Route Identification & Leasing Guidelines (2021) 'strongly encourages' use of the same site selection process outlined in the Cable Route Protocol during the identification of onshore transmission infrastructure.
[3] This maximum distance of 3km is set in order to minimise the length of cable between the project's onshore substation and the grid connection point. Minimising this distance is necessary to reduce the general impacts from cabling, to minimise electrical losses which improves overall system efficiency, reduce/eliminate the need for additional equipment to compensate for losses and to minimise the overall cost of the connection. The 3km distance was selected on the basis of previous project and industry experience.
[4] This threshold of 20km was used to define the onshore scoping area to limit the general impacts and electrical losses arising from extensive electrical cabling onshore.

- Excluding all population centres of over 5,000 inhabitants[5];
- Excluding all international designated sites for nature conservation (Ramsar sites) and sites on the UK National Sites Network (SAC / SPA);
- Excluding all National Landscape[6] designations; and
- Where other significant elements of linear built infrastructure (i.e. A-roads, railways, etc.) isolate parcels of the 3km buffer which would be too small to site options in, these have also been removed.

79. The area of search is shown in ES Figure 4.12 (Document Reference: 3.2.2).

4.8.2 Long list options

80. Following identification of an area of search, a constraints mapping exercise was undertaken to identify an initial 'long list' of potential options for the location of the onshore substation.

81. The following list of constraints were considered during the constraint mapping exercise:

- SPAs;
- SACs;
- Ramsar sites;
- SSSIs;
- LNR;
- National Nature Reserves (NNR);
- National Landscapes[7];
- National Parks;
- Country Parks / Registered Parks and Gardens;
- Ancient woodland;
- UK Habitats of Principal Importance (UKHPI);
- RSPB reserves;
- Main Rivers;
- Flood Zones 2 & 3;
- Conservation areas;
- Listed buildings;
- Scheduled monuments;

[5] Using ONS Built-Up Area dataset (2011).
[6] Formerly AONBs.
[7] Formerly AONBs.

- Historic landscape;
- LiDAR data (if available) for identifying unknown buried heritage;
- Antiquity find spots;
- Historic landfill sites;
- Source Protection Zones (SPZs);
- Agricultural land classification (Best and Most Versatile (BMV) land);
- Heritage Coast;
- Key settlements (OS Built up areas);
- Residential properties plus 250m disturbance buffers around them;
- Main roads (A roads and B roads);
- Railways;
- Public Rights of Way (PRoW);
- National Cycle Network (NCN) routes;
- Tourist attractions (e.g. golf course, caravan parks); and
- Planning applications and extant planning permissions.

82. Consultation with the site selection ETG[8] on the long list options and the site selection process was undertaken in April 2022, as outlined in Section 4.2. This consultation sought feedback on the above list of constraints, which was used to review and updated the list of constraints considered.

83. Using these constraints, parcels of less 'constrained' land were identified within the area of search, which had the space to potentially accommodate onshore substation infrastructure for the North Falls and the Five Estuaries projects. This includes space for two project onshore substation platforms, and associated landscaping and environmental mitigation, access and drainage requirements. These options are shown in ES Figure 4.13 (Document Reference: 3.2.2).

4.8.3 Comparative assessment and short-listing process

84. The long-listed options were subject to a detailed comparative 'RAG' assessment process to assess the constraints and opportunities of each option. This process involved a detailed technical review of each option by engineering, environmental, planning and land professionals in order to identify the relative constraints for each option. Each option was assessed against an extensive list of over 50 technical criteria such as risk of flooding, ease of access from the public highway and degree of buried site archaeological potential. Higher risk or unfeasible options were given a 'red' rating against different technical criteria,

[8] Site selection consultees included Essex County Council, Tendring District Council, Natural England, the Environment Agency and Historic England.

whilst those with medium risks were coded ‘amber’ and those with the least risk were assigned ‘green’.

85. Once all options had been assessed the relative number of ‘red’ and amber’ risks for each were compared and the least constrained options identified. Initially, options were considered on the following bases:

- Potentially not consentable due to conflict with an applicable policy or because environmental mitigation is unlikely to reduce an effect to a non-significant level,
- Potentially not technically feasible, or
- Challenging to secure land rights for.

86. Key risks identified for options ruled out at this stage included:

- Construction traffic would need to route past sensitive receptors on the local highway network to reach the option;
- The option is within 100m of sensitive noise receptors;
- Land subject to planning allocations is present;
- Extensive known buried heritage present within option;
- Slopes of >1 in 30 in areas of the option;
- Connection to potential onshore cable routes is heavily constrained, with extensive additional cabling required; and
- Connection to national grid substation likely to be heavily constrained, with extensive additional cabling required.

87. Note one constraint which applied to all options identified at this stage was BMV land. Although a constraint which the Project was seeking to avoid, all land falling with the 3km search area around the national grid connection point (see Section 4.8.1) was BMV land, and therefore this constraint was not able to be avoided whilst meeting the Project’s technical site selection criteria.

88. As a result, three options were discounted from further consideration. The remaining options were subject to further consideration, as well as amendments and refinement to avoid some of the constraints considered in the review.

4.8.4 Further studies, and identification of a preferred option

89. The RAG assessment exercise identified a series of uncertainties regarding the degree of risk / opportunity with the short-listed options. NFOW then sought to reduce these uncertainties by commissioning a series of studies. The studies undertaken are outlined in Table 4.3.

Table 4.3 Further studies undertaken to inform the onshore substation site selection exercise.

Study	Description
Landscape site walkover	A walkover of the short-listed options to assess: • Baseline landscape character and landscape susceptibility to change; • Landscape designations; • Principal visual receptors; and

Study	Description
	• Physical suitability of site for substation and mitigation.
Substation access strategy	A desk-based exercise to identify potential access routes to 10 options identified as 'inaccessible' from the public highway during the long list RAG assessment. The purpose of the exercise was to confirm whether potential access routes from the public highway to these options exist, and then to ensure these potential access routes are included in the RAG assessment so they can be assessed by other topics.
Heritage assessment	A detailed assessment of Historic Environment Record (HER) data for the onshore substation options, to identify the potential for known and unknown buried heritage within each option footprint, and to improve understanding of the relative risk of encountering sensitive archaeology at each option.
Extended Phase 1 Habitat Survey	A walkover survey of the short listed options to identify the protected species potential of the habitats present. In particular, the following were searched for: • Veteran trees; • Habitat condition; • Field signs of badgers; • Suitable habitat for roosting and commuting / foraging bats; • Suitable habitat for great crested newts; • Suitable habitat for hazel dormice; • Suitable habitat for water voles / otters; • Suitable habitat for common reptile species; • Suitable habitat for nesting birds; and • Presence of invasive / non-native species.
Drainage assessment	A review of each short listed option to identify potential options for drainage management, to understand whether gravity-fed drainage is feasible, where options would drain into and what other drainage solutions would be required in the event that a gravity-fed solution is not available.
Utilities	A review of utilities data for each short listed option.
NPS Sensitivity Test	A review of the preferred option(s) against the provisions in NPSs which set the planning policy for the Project (EN-1, EN-3 and EN-5, including the latest NPS applicable at the time of assessment (DESNZ, 2023a-c)).

90. Following the conclusion of these studies, the RAG assessment work was reviewed and updated and then the options subject to further comparative assessment in order to identify a preferred option.

91. The preferred option selected represents a 'zone' (herein the 'onshore substation zone') covering two of the options identified during the initial long-listing process. By combining two options, some of the key constraints around the sites' buried archaeology potential could be avoided, whilst retaining flexibility in the Project's design envelope, in advance of engineering design work.

92. The onshore substation zone identified through this process is an approximately 60ha area located either side of Ardleigh Road to the east of the village of Ardleigh in Tendring district, Essex. The zone is bounded by minor roads to the west and north, field boundaries to the north-east and south, the upper reaches of the Tenpenny Brook to the east and the existing Lawford substation site to

the west. The zone is entirely comprised of flat-lying arable land in current use and has no internal boundary features. The nearest property is approximately 250m to the east, and the nearest settlement is the village of Little Bromley, approximately 1km to the east. The onshore substation zone is shown in ES Figure 4.14 (Document Reference: 3.2.2).

93. The onshore substation zone is the area which was assessed within the PEIR.

4.8.5 Refinement post-PEIR

94. Three further activities took place following the receipt of PEIR feedback in 2023 which have taken the site selection process from the onshore substation zone to the onshore substation works area and onshore substation location presented within this ES:

- Co-ordination with Five Estuaries;
- Identification of ancillary infrastructure;
- Identification of a construction access route (Bentley Road improvement works).

4.8.5.1 Co-ordination with Five Estuaries

95. In July 2023, NFOW and VEOWL reached an agreement to undertake a joint engineering exercise to identify potential locations for the onshore substation and associated onshore substation works area for both the Five Estuaries and North Falls projects within a combined onshore substation works area.

96. The first element of this work was to identify a refined onshore substation works area, within which all works associated with construction and operation of the onshore substations would take place. It was concluded that land south of Ardleigh Road within the onshore substation zone would not be taken forward, due to limited space to design a co-located option with Five Estuaries, in addition to other constraints (e.g. buried heritage, existing watercourse features present). Also, additional land to the east of the onshore substation zone to facilitate access to the onshore substation was required (see below). Following these amendments, a refined area, referred to as the onshore substation works area, was identified, as shown in ES Figure 4.15 (Document Reference: 3.2.2).

97. Once a refined onshore substation works area was identified, potential locations for an onshore substation, co-located with a Five Estuaries onshore substation, within the area were identified. Factors including existing utilities and environmental constraints (overhead lines, residential receptors, existing mature trees and drainage features, buried heritage), the availability of landscaping, drainage requirements, access, ongoing connection to the national grid and technical electrical requirements were considered. The conclusion of this process was the identification of co-located platforms for North Falls and Five Estuaries onshore substations, as shown in ES Figure 4.15 (Document Reference: 3.2.2). The layouts are indicative subject to detailed design of the substation post-consent.

4.8.5.2 Identification of ancillary infrastructure

98. The onshore substation requires the following additional ancillary infrastructure during construction and operation:

- TCC;
- Construction and operational drainage;
- Construction and operational access;
- Land for operational landscaping; and
- Land for operational environmental mitigation.

99. In order to inform the requirements of this ancillary infrastructure, bespoke studies have been undertaken, in the outcomes of which are detailed in the Outline Operational Drainage Strategy (Document Reference: 7.19) and Outline Landscape and Ecological Management Strategy (Document Reference: 7.14) submitted with the DCO application.

100. The onshore substation layout has been designed to allow space for this ancillary infrastructure. Further details and indicative locations for this ancillary infrastructure are set out in ES Chapter 5 Project Description (Document Reference: 3.1.7) and ES Figure 5.2 (Document Reference: 3.2.3).

4.8.5.3 Identification of a construction access route

101. It was identified during early transport assessment work for the Project that the capacity of local road network between the SRN and the onshore substation works area would require further assessment in order to identify a suitable route for the Abnormal Indivisible Loads (AILs) and Heavy Goods Vehicles (HGV) movements required during construction to access the onshore substation site.

102. An initial onshore substation access study was undertaken during the onshore substation site selection (as described in Section 4.8.4), which identified that there were available options for accessing the preferred onshore substation zone from the SRN. Following this, NFOW commissioned two studies, looking at the preferred route from the SRN for HGVs and for AILs. These studies looked at construction route options to potentially access the onshore substation zone from the A120 via Bentley Road, Great Bromley, or Colchester Road to the south, or from the A137 via Lawford or Ardleigh to the north and west. In total, seven route options for accessing the onshore substation zone during construction were considered.

103. A key option considered was use of an onshore substation construction haul road, in part along the onshore cable route to reduce likely significant effects upon communities as far as practicable. The benefits of doing this are to take the construction traffic off the adopted local road network and onto a dedicated construction route which has been designed to bypass sensitive community and settlement receptors, and as a temporary route it does not involve the level construction required for a new permanent access route across greenfield land. The onshore cable route crosses Bentley Road south of Little Bromley, and is a short distance (1km) from the A120 to the onshore cable route in this area.

104. The benefits of using the construction haul road in terms of taking onshore substation construction traffic off the adopted roads and preventing the need to route HGVs and AIL through the communities of Little Bromley or Great Bromley has resulted in this option being selected as the preferred option for temporarily accessing the onshore substation for construction.

105. In order to facilitate access along the construction haul road via this option, improvement works are required to Bentley Road between the A120 and the onshore cable route, to ensure capacity for two-way HGV movements. These works involve road widening and the provision for a non-motorised user route. These works are referred to as the 'Bentley Road Improvement works', and are described in more detail in ES Chapter 5 Project Description (Document Reference: 3.1.7).

4.8.6 Onshore substation works area

106. Following the refinement activities outlined above, and onshore substation works area and onshore substation location has been defined for assessment within this ES, as shown in ES Figure 4.15 (Document Reference: 3.2.2).

4.9 Onshore cable route

107. In parallel with the landfall refinement and onshore substation site selection work, a process to identify the onshore cable route for the Project was undertaken. This process can be broadly split into four phases of site selection:

1. Initial cable corridor identification;
2. Combined cable corridor site selection, in collaboration with VEOWL;
3. Ongoing cable corridor refinement and corridor identification north of the A120, leading to the identification of preferred onshore cable corridor(s) (as assessed in PEIR); and
4. Identification of an onshore cable route (which forms the basis of the DCO application).

108. These four phases of site selection have all been undertaken using the Project's 'golden rules', as described in ES Appendix 4.1 (Document Reference: 3.3.1.1). As with other elements of the transmission infrastructure site selection process described above, this process has adhered to the recommendations regarding site selection described within the NPSs (especially EN-1 and EN5) and the Electricity Act 1989.

4.9.1 Initial cable corridor identification

109. An initial exercise was undertaken to identify broad, 400m wide corridors during Spring / Summer 2021. At this time the Project was not in receipt of a formal grid connection location and corridors were identified based on assumptions regarding the potential maximum extent of transmission infrastructure required. The purpose of this exercise was to identify key high-level constraints which potentially would rule out cable routing from certain areas in order to start to narrow the scope of ongoing environmental studies.

110. The broad corridors sought to connect the Project's initial landfall search area (see Section 4.6) with land bounded by the Great Eastern Rail Line to the north-west of the Tendring peninsula, whilst also potentially serving grid connection points along this route.

111. For the generation of initial broad corridors, the following principles were used:

- Routing should be kept as straight and as short as practicable – avoiding tight bends;
- Avoid residential titles (including whole garden) where practicable;
- Avoid direct significant impacts to internationally and nationally designated areas (e.g. SACs, SPAs, Ramsar sites, NNRs and SSSIs);
- Avoid direct significant impacts to mature woodland and ancient woodland;
- Avoid scheduled ancient monuments and listed buildings;
- Avoid historic or active landfill sites;
- Minimise the number and length of trenchless crossings;
- Minimise the number of crossings of assets (e.g. utilities);
- Minimise the number of road and rail crossings;
- Minimise the number of hedgerow crossings; and
- Minimise the number of watercourse crossings and number of ponds affected.

112. In addition to the principles above, all onshore cable route options need to be technically and economically feasible and to that end are subject to a constructability review as part of the site selection process.

113. This exercise generated ten 400m wide onshore cable corridor options between the landfall search area and land in the north-west of the Tendring peninsula.

114. These options were subject to an initial engineering and environmental 'RAG' assessment, following the approach outlined in Section 4.8. The RAG assessment exercise proceeded to identify a series of high or 'red' constraints associated with some of the options identified, including:

- Areas of steep slopes (>1 in 12) along routes, for which construction options are likely severely restricted;
- Significant pinch points around aggregations of constraints at obstacles crossing points;
- Excessive number of watercourse / woodland (including ancient woodland) / local wildlife site crossings;
- Multiple crossings of the Holland Haven Marshes SSSI;
- Extended cable corridor length; and
- Presence of planning allocations, planning applications and extant planning permissions.

115. Options with increased numbers of high or 'red' constraints were removed at this stage, and five 400m wide onshore cable corridor options were retained for further consideration. These options were then used broadly as the basis for certain elements of environmental data collection onshore to inform the Project's EIA.

4.9.2 Combined cable corridor site selection, in collaboration with VEOWL

116. As outlined in Section 4.1.5, following the publication of the draft NPS EN-1 and EN-3, stakeholder feedback and also taking into account common goals around realising project efficiencies, NFOW and VEOWL agreed that both parties would engage in a collaborative exercise around identifying North Falls and Five Estuaries (herein 'the Projects') onshore export cable infrastructure. Following this agreement, NFOW and VEOWL jointly undertook a combined cable corridor study to look at the potential for identifying a single onshore cable corridor option for connecting the Projects' landfall to land to the north-west of the A120 within the Tendring peninsula.

117. At the outset of the study in summer 2021, a grid connection location had not been confirmed by NGET, however this was provided during the study's progress and was therefore used to determine the output of the process.

118. The combined cable corridor study involved the following steps, each of which is described below (see ES Figures 4.16 – 4.18 (Document Reference: 3.2.2)):

- Undertaking an exercise to combine the wider corridors defined by each project to date into a single set of 500m wide corridors;
- Refining the 500m wide corridors down to 204m-wide corridors;
- Undertaking a 'RAG' assessment of the 204m-wide corridors, to select a single preferred 204m wide corridor option.

4.9.2.1 Combining North Falls and Five Estuaries corridors

119. Both projects' initial cable corridors were overlaid onto each other and then combined into a single set of 500m wide corridors. This meant widening the corridors generated previously for North Falls. The combined corridors can be seen in ES Figure 4.16 (Document Reference: 3.2.2).

4.9.2.2 Refining the 500m wide corridors down to 204m-wide

120. The 500m wide cable corridors were refined to 204m, a width identified by NFOW and VEOWL as a suitable worst case envelope for construction of the two projects side by side using open cut trenching methods.

121. During the process of refining the 500m corridors, additional information was used to inform the refinement, including:

- Consideration of potential grid connection locations between landfall and land to the north-west of the A120 within the Tendring peninsula;
- Engineering review of potential pinch points;
- Initial landowner feedback along the routes.

122. These considerations led to the following set of amendments to the cable corridors during the refinement process:

- Western cable corridor around Holland Brook removed due to strategic allocations (planning constraints (surrounding Holland-on-Sea / Little Clacton)) and constrained pinch point between the railway line and Holland Brook determined, following engineering review, to be too narrow to achieve successful crossing;

- Western cable corridors refined to take into account pinch points around residential properties;
- North-eastern cable corridors north of Thorpe-le-Soken moved further from properties due to perceived landowner concern;
- Northern corridors amended to connect with potential grid connection points;
- Corridors amended around pinch points at residential properties, watercourses, reservoirs, railway line, woodlands.

123. The refined combined corridors can be seen in ES Figure 4.17 (Document Reference: 3.2.2).

4.9.2.3 'RAG' assessment of the 204m-wide corridors to select a single preferred 204m-wide corridor option

124. The refined cable corridor options were then subject to a 'RAG' assessment following the methodology outlined in Section 4.8. This assessment identified a preferred option ('East 2'), on the following basis:

- 0.45km shorter than any other option (reduced disruption and reduced cost);
- Fewest number of pinch points (i.e. 'spatial constraints') (three) along route;
- Joint fewest number of Main Rivers crossed (one);
- Joint fewest number of residential areas across route needing to be navigated (one); and
- All other environmental criteria being equal between the corridor options.

125. The outcome of the combined cable corridor study was to identify a preferred onshore cable corridor(s) option which connects the cable landfall to the land to the north-west of the A120 within the Tendring peninsula. The preferred option is shown on ES Figure 4.18 (Document Reference: 3.2.2).

4.9.3 Ongoing cable corridor refinement and corridor identification north of the A120

126. Following the completion of the combined cable corridor study, further ongoing refinement has taken place, as the Project's onshore data collection has continued to gather data to inform cable corridor refinement, and as further engineering assessments have fed into the feasibility.

127. In addition, a separate onshore cable corridor site selection study was undertaken for North Falls to identify an onshore cable corridor to connect the combined cable corridor(s) from the A120 to the North Falls onshore substation zone (see Section 4.9.3.2).

4.9.3.1 Further cable corridor refinement

128. North Falls commissioned a series of further engineering studies of the onshore cable corridor(s) in order to ensure its technical feasibility. These included:

- Widening the combined cable corridor near the coast, to accommodate the Project's landfall search area;

- Reviewing all obstacle crossings, and selecting a preferred method and alternative crossing method for each (see Crossing Schedule, ES Appendix 5.1 (Document Reference: 3.3.2));
- Widening the corridor at more complex obstacle crossings (e.g. railways, major 'A' roads), where an up to 243m-wide corridor is required to accommodate the potential thermal requirements of cable buried at greater depth (i.e. up to 10m);
- Retaining cable corridor flexibility around Thorpe-le-Soken to seek to reduce potential indirect effects upon the Hamford Water SAC;
- Adding temporary construction compounds to the onshore cable corridor(s);
- Widening the cable corridor around buried utilities to accommodate required stand-off distances requested by utility companies; and
- Widening the cable corridor to take account of other identified planning and environmental constraints, including woodland parcels and planning application boundaries.

4.9.3.2 Cable corridor study north of the A120

129. The cable corridor study north of the A120 sought to identify onshore cable corridor(s) options from the combined cable corridor from the A120 to the North Falls onshore substation zone. At the outset of the study, multiple options were still being considered for the onshore substation zone.

130. The approach to identification and assessment of cable corridors north of the A120 followed that undertaken for the combined cable corridor. Three initial 204m wide options were identified, and then refined in line with the wider changes to the combined cable corridor outlined in Section 4.9.3.1. These options are shown in ES Figure 4.19 (Document Reference: 3.2.2). The options were then subject to comparative environmental, engineering, planning and land 'RAG' assessment.

131. Through comparison of the relative environmental, engineering, planning and land constraints an opportunities with each option, the RAG assessment led to the identification of option 'CR01' as the preferred option. The key red risks identified for other options which led to them being excluded include cable length, the number of complex obstacle crossings required, and the feasibility of connecting into onshore substation zones under consideration by North Falls and Five Estuaries.

4.9.3.3 Selection of onshore cable corridor(s) (assessed in PEIR)

132. Following the conclusion of the onshore cable corridor site selection exercises outlined above, a set of onshore cable corridor(s) were identified for assessment within the PEIR.

133. The onshore cable corridor(s) included predominantly a single combined cable corridor connecting the landfall search area to the onshore substation zone, including the following parameters:

- Minimum 204m wide;
- Maximum 243m wide (at trenchless crossing locations / complex crossings);

- Suitable to accommodate temporary works for two projects (North Falls and Five Estuaries);
- Includes three corridor options at land immediately north of Thorpe-le-Soken, to accommodate flexibility when crossing land in proximity to Hamford Water SAC and Thorpe-le-Soken settlement;
- Includes land for temporary construction compounds; and
- Includes a decision about the envelope of crossings techniques to be assessed at each obstacle (e.g. roads, rail, utilities, watercourses, sensitive habitats, etc.).

134. The onshore cable corridor(s) identified through the process outlined above and considered within the PEIR are shown on ES Figure 4.20 (Document Reference: 3.2.2).

4.9.4 Identification of the onshore cable route

135. Following the identification of the onshore cable corridor(s) which were described in the PEIR, further activities were undertaken to refine these down into the onshore cable route which forms the basis of the DCO application. These included:

- Refinement of the minimum 204m-wide onshore cable corridor(s) down to a 72 - 130m wide onshore cable route;
- Selection of a preferred onshore cable route around Thorpe-le-Soken; and
- Addition of ancillary infrastructure to support onshore cable route construction, including TCCs, construction accesses (and associated visibility splays), off-route haul roads and operation and maintenance (O&M) accesses.

4.9.4.1 Refinement of the onshore cable route

136. In July 2023, the projects reached an agreement to undertake a joint engineering exercise to refine the existing minimum 204m-wide onshore cable corridor(s) down to a single, 72 - 130m wide onshore cable route connecting the North Falls and Five Estuaries' landfall and onshore substations. This refined onshore cable route has been designed to ensure capacity for the installation of up to four electrical circuits, two per project, installed in cable ducts, from landfall to the onshore substations. This approach has been undertaken to ensure that should commercial and regulatory constraints allow, the projects will have the option to undertake a single joint cable installation activity for the cable ducts for both projects, therefore realising efficiencies and minimising effects associated with two independent construction activities.

137. In order to refine the onshore cable corridor(s), the following principles were agreed:

- A 72m-wide onshore cable route is required in areas of open-cut trenching, 90m in areas of simple trenchless crossings, and up to 130m in areas of complex trenchless crossings;

- The onshore cable route should be able to be accessed fully during construction and operation, with the exception of significant barriers (e.g. major infrastructure (A-roads, railways); Main Rivers etc.);
- Sensitive environmental features (e.g. hedgerows, watercourses, areas of ecological interest) should be subject to trenchless crossing where practicable; and
- Sensitive environmental features and associated buffer zones should be taken into account during route refinement, in particular buried heritage, sensitive ecological features and residential receptors (for full list, see Section 4.8.2). A few key examples of where this has been taken into account include land north of Little Clacton Road (potential buried heritage present); land between Thorpe Road and Whitehall Road (sensitive ornithological interest features); land from Thorpe Road to the A120 (utilities present) land west of Spratts Lane (potential buried heritage).

138. This joint engineering exercise included input from environmental, land and planning technical teams during the process. The output was the identification of a refined onshore cable route for North Falls and Five Estuaries, as shown in ES Chapter 5 Project Description (Document Reference: 3.1.7) ES Figure 5.2 (Document Reference: 3.2.3).

4.9.4.2 Selection of a preferred onshore cable route around Thorpe-le-Soken

139. Three onshore cable corridor options immediately north of Thorpe-le-Soken were retained within the onshore project area assessed at PEIR, to accommodate flexibility when crossing land in proximity to Hamford Water SAC and Thorpe-le-Soken settlement and to receive feedback through the Project's statutory consultation on the merits of these options (see ES Figure 4.21 (Document Reference: 3.2.2)).

140. Following receipt of consultation feedback, including on the PEIR, a new site selection exercise was undertaken on the three options. This exercise was able to draw on new information gathered since the publication of the onshore cable corridor(s), including new environmental data from onshore surveys through 2022/3 and information from landowner consultation feedback. Once refined through the exercise outlined in Section 4.9.4.2, the options were subject to comparative environmental, engineering, planning and land 'RAG' assessment, following the approach set out in Section 4.9.2.

141. Through comparison of the relative environmental, engineering, planning and land constraints an opportunities with each option, the RAG assessment led to the identification of option 'Route A' being selected as the preferred option. The key red risks identified for other options which led to them being excluded included proximity to Hamford Water SAC and the need to cross a Main River upstream of the SAC, plus engineering pinch points related to the presence of 21" water main utility, proximity to sensitive groundwater resources and proximity to potential buried heritage (a Roman Road).

142. Route A was therefore selected as the onshore cable route in this area.

4.9.4.3 Addition of ancillary infrastructure

143. As part of the refinement exercise outlined in Section 4.9.4.1, an exercise has been undertaken to identify suitable locations for ancillary infrastructure

required to facilitate the construction and operation of the onshore cable route. This includes:

- TCCs;
- Construction accesses, including associated visibility splays;
- Off-route haul roads; and
- O&M accesses.

144. These elements of ancillary infrastructure have been incorporated into the onshore project area, and their location is show on ES Figure 4.22 (Document Reference: 3.2.2). Details of the infrastructure required at each of these elements of the onshore project are provided in ES Chapter 5 Project Description (Document Reference: 3.1.7).

145. The process for determining suitable locations for each element of ancillary infrastructure has been led by engineering studies, and included a review from the environmental, planning and land teams to identify any potential constraints associated with each. Construction accesses have all been subject to Road Safety Audits and their locations critically reviewed through this process, as described in more detail in ES Chapter 27 Traffic and Transport (Document Reference: 3.1.29).

4.9.4.4 Onshore cable route

146. Following the completion of the exercises outlined in Section 4.9.4, an onshore cable route to be included within the DCO application has been identified. The layout of the onshore cable route is shown on ES Figure 4.22 (Document Reference: 3.2.2).

4.10 Summary

147. The site selection process for North Falls has been continuous since the Project's inception and has been closely aligned with the project EIA process. The process has been iterative, multi-disciplinary and consultative, seeking to gather as much engineering, environmental, planning, land and stakeholder input to ensure informed decisions about site selection are made early in the project design process.

148. A summary of the key decisions made during the site selection process is provided in Table 4.4.

Table 4.4 Summary of alternatives and preferred options selected

Infrastructure element	Alternatives assessed	Preferred option
Offshore cable corridor	The following alternative offshore cable corridors (shown on ES Figure 4.9 (Document Reference: 3.2.2)) were considered: • North A; • North B; • (following consultation) North C; • Central; • South A; and • South B.	North C (ES Figure 4.10 (Document Reference: 3.2.2)).

Infrastructure element	Alternatives assessed	Preferred option
Landfall	Alternative areas at (ES Figure 4.4 (Document Reference: 3.2,2): • Jaywick; • Clacton-on-Sea to Frinton-on-Sea; and • Dovercourt. Alternative options within Clacton-on-Sea to Frinton-on-Sea (ES Figure 4.5 (Document Reference: 3.2.2)): • Chevaux-de-Frise; • Kirby Brook; and • Holland Brook.	Kirby Brook (ES Figure 4.6 (Document Reference: 3.2.2)).
Onshore cable route	Ten initial 400m onshore cable corridor(s) between the landfall search area and the A120. Seven 204m-wide combined onshore cable corridor(s) capable for supporting infrastructure for two projects (ES Figure 4.17 (Document Reference: 3.2.2)). Three options north of the A120 (ES Figure 4.19 (Document Reference: 3.2.2)). Three options north of Thorpe-le-Soken (ES Figure 4.21 (Document Reference: 3.2.2)).	A single, 72 - 130m wide onshore cable route connecting the landfall to the onshore substation, capable of supporting infrastructure for North Falls and Five Estuaries, and including ancillary infrastructure required for cable route construction and operation (ES Figure 4.22 (Document Reference: 3.2.2)).
Onshore substation	Eight potential options for locating infrastructure for onshore substations for two projects (ES Figure 4.13 (Document Reference: 3.2.2)). Seven potential construction access routes to the onshore substation.	A single onshore substation works area along Ardleigh Road west of the village of Little Bromley, with capacity to accommodate North Falls and Five Estuaries ES Figure 4.15 (Document Reference: 3.2.2).

4.11 References

BEIS (2020) Energy White Paper; Powering our Net Zero Future. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf. Accessed 08/10/2021.
DESNZ (2023a) Overarching National Policy Statement for Energy (EN-1). Available at: https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1
DESNZ (2023b) National Policy Statement for Renewable Energy Infrastructure (EN-3) Available at: https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3
DESNZ (2023c) National Policy Statement for Electricity Networks Infrastructure (EN-5). Available at: https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5
National Grid (undated). Guidelines on Substation Siting and Design (The Horlock Rules) (Online) Available at: www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=13796. Accessed 09/10/2020.
National Grid Company (NGC) (2006). The Holford Rules: Guidelines for the Routeing of New High Voltage Overhead Transmission Lines.
National Grid Electricity Transmission (2023) Norwich to Tilbury Design Development Report June 2023 Issue number: AENC-NG-CNS-REP-0002. Accessible at: [redacted]
National Grid Electricity Transmission (2023a) Norwich to Tilbury Strategic Options Backcheck and Review June 2023. Issue number: AENC-NG-TNS-REP-0001. Accessible at: [redacted]
National Grid Electricity Transmission (2024) Norwich to Tilbury - Consultation Plans - Section C. Available at: [redacted]
Planning Inspectorate (2018) Advice Note Nine: Rochdale Envelope. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/
Planning Inspectorate (2020) Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-seven-environmental-impact-assessment-process-preliminary-environmental-information-and-environmental-statements/#:~:text=Advice%20Note%20Seven%3A%20Environmental%20Impact%20Assessment%3A,Process%2C%20Preliminary%20Environmental%20Information%20and%20Environmental%20Statements

The Crown Estate (2019). Record of the Habitats Regulations Assessment Undertaken under Regulation 63 of The Conservation of Habitats and Species Regulations 2017 and Regulation 28 of The Conservation of Offshore Marine Habitats and Species Regulations 2017. 2017 Offshore Wind Extensions Plan, dated 28 August 2019.

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