East Anglia TWO Offshore Windfarm

Chapter 4

Site Selection and Assessment of Alternatives

Environmental Statement
Volume 1

Applicant: East Anglia TWO Limited
Document Reference: 6.1.4
SPR Reference: EA2-DWF-ENV-REP-IBR-000896 Rev 01
Pursuant to APFP Regulation: 5(2)(a)

Author: Royal HaskoningDHV
Date: October 2019
Revision: Version 1

Prepared by:	Checked by:	Approved by:
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Revision Summary				
Rev	**Date**	**Prepared by**	**Checked by**	**Approved by**
01	08/10/2019	Paolo Pizzolla	Julia Bolton	Helen Walker

Description of Revisions			
Rev	**Page**	**Section**	**Description**
01	n/a	n/a	Final for Submission

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Glossary of Acronyms

AIS	Air Insulated Switchgear
AONB	Area of Outstanding Natural Beauty
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CION	Connection and Infrastructure Options Note
EAOW	East Anglia Offshore Wind
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ETG	Expert topic Group
GIS	Geographical Information System
GWFL	Galloper Wind Farm Limited
HDD	Horizontal Directional Drilling
IMO	International Maritime Organisation
MaRS	Marine Resources System,
MCA	Martine and Coastguard Agency
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
NE	Natural England
NPPF	National Planning Policy Framework
OESEA	Offshore Energy Strategic Environmental Assessment
PEIR	Preliminary Environmental Information Report
PROW	Public Rights of Way
RAG	Red Amber Green
REC	Regional Environmental Characterisation
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SPA	Special Protection Area
SPR	ScottishPower Renewables
SSSI	Site of Special Scientific Interest
TWT	The Wildlife Trust
ZAP	Zone Appraisal Planning
ZDA	Zonal Development Agreement
ZEA	Zone Environmental Assessment

Glossary of Terminology

Applicant	East Anglia TWO Limited.
Cable sealing end compound	A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Cable sealing end (with circuit breaker) compound	A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Construction consolidation sites	Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure.
Construction operation and maintenance platform	A fixed offshore structure required for construction, operation, and maintenance personnel and activities.
Development area	The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).
East Anglia TWO project	The proposed project consisting of up to 75 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia TWO windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and the information required to support HRA.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
HDD temporary working area	Temporary compounds which will contain laydown, storage and work areas for HDD drilling works.
Inter-array cables	Offshore cables which link the wind turbines to each other and the offshore electrical platforms, these cables will include fibre optic cables.
Jointing bay	Underground structures constructed at intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Link boxes	Underground chambers within the onshore cable route housing electrical earthing links.

Meteorological mast	An offshore structure which contains metrological instruments used for wind data acquisition.
Mitigation areas	Areas captured within the onshore development area specifically for mitigating expected or anticipated impacts.
Marking buoys	Buoys to delineate spatial features / restrictions within the offshore development area.
Monitoring buoys	Buoys to monitor *in situ* condition within the windfarm, for example wave and metocean conditions.
National electricity grid	The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission
National Grid infrastructure	A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia TWO project Development Consent Order but will be National Grid owned assets.
National Grid overhead line realignment works	Works required to upgrade the existing electricity pylons and overhead lines (including cable sealing end compounds and cable sealing end (with circuit breaker) compound) to transport electricity from the National Grid substation to the national electricity grid.
National Grid overhead line realignment works area	The proposed area for National Grid overhead line realignment works.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia TWO project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia TWO project Development Consent Order.
National Grid substation location	The proposed location of the National Grid substation.
Natura 2000 site	A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.
Offshore cable corridor	This is the area which will contain the offshore export cables between offshore electrical platforms and landfall.
Offshore development area	The East Anglia TWO windfarm site and offshore cable corridor (up to Mean High Water Springs).
Offshore electrical infrastructure	The transmission assets required to export generated electricity to shore. This includes inter-array cables from the wind turbines to the offshore electrical platforms, offshore electrical platforms, platform link cables and export cables from the offshore electrical platforms to the landfall.
Offshore electrical platform	A fixed structure located within the windfarm area, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Offshore export cables	The cables which would bring electricity from the offshore electrical platforms to the landfall. These cables will include fibre optic cables.
Offshore infrastructure	All of the offshore infrastructure including wind turbines, platforms, and cables.
Offshore platform	A collective term for the construction, operation and maintenance platform and the offshore electrical platforms.

Onshore cable corridor	The corridor within which the onshore cable route will be located.
Onshore cable route	This is the construction swathe within the onshore cable corridor which would contain onshore cables as well as temporary ground required for construction which includes cable trenches, haul road and spoil storage areas.
Onshore cables	The cables which would bring electricity from landfall to the onshore substation. The onshore cable is comprised of up to six power cables (which may be laid directly within a trench, or laid in cable ducts or protective covers), up to two fibre optic cables and up to two distributed temperature sensing cables.
Onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed East Anglia TWO project from landfall to the connection to the national electricity grid.
Onshore preparation works	Activities to be undertaken prior to formal commencement of onshore construction such as pre–planting of landscaping works, archaeological investigations, environmental and engineering surveys, diversion and laying of services, and highway alterations.
Onshore substation	The East Anglia TWO substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia TWO project.
Platform link cable	Electrical cable which links one or more offshore platforms. These cables will include fibre optic cables.
Safety zones	A marine area declared for the purposes of safety around a renewable energy installation or works / construction area under the Energy Act 2004.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
Transition bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

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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 the approach undertaken by East Anglia TWO Limited (the Applicant) to define the various elements of the proposed East Anglia TWO project. The process includes consideration of both the offshore and onshore infrastructure and associated infrastructure, and the assessment of reasonable alternatives as the proposed East Anglia TWO project has developed through the pre-application process.

2. An important part of the Environmental Impact Assessment (EIA) process is to describe the reasonable alternatives considered during the evolution of the proposed East Anglia TWO project, such as development design, technology, location, size and scale, and to set out the main reasons for selecting the chosen option.

3. For the offshore development area, the former East Anglia Zone within which the East Anglia TWO windfarm site is located (***Figure 4.1***) was identified as part of The Crown Estate Round 3 Offshore Wind Farm development process. As such, the East Anglia TWO windfarm site selection was limited to areas within the former East Anglia Zone.

4. This chapter outlines the site selection process for the proposed East Anglia TWO project. Due to the strategic approach of developing both the proposed East Anglia TWO and East Anglia ONE North projects in parallel, the onshore site selection process is based on the co-location of the onshore infrastructure associated with both the proposed East Anglia TWO and East Anglia ONE North projects (see ***Chapter 1 Introduction*** and ***Chapter 6 Project Description*** for further details on the relationship between the proposed East Anglia TWO and East Anglia ONE North projects). Co-location of the onshore infrastructure provides benefits through the efficient and economic siting of infrastructure (in line with the Overarching National Policy Statement for Energy (NPS-EN1)). In addition, the consolidation of onshore infrastructure in a single location keeps development within a localised area and, in so doing, will contain the extent of potential impacts.

4.2 Key Components of East Anglia TWO

5. The proposed East Anglia TWO project will comprise the following main offshore components:

- Wind turbines and their associated foundations;
- Offshore platforms and their associated foundations (electrical platforms and construction, operation and maintenance platform);
- Subsea cables and cable protection – offshore export cables, fibre optic cables, platform link cables and inter-array cables;
- Meteorological masts (met masts) and their associated foundations; and
- Monitoring equipment including Light Detection and Ranging (LiDAR) and wave buoys.

6. The proposed East Anglia TWO project will comprise the following main onshore components:

- Up to four ducts installed under the cliff at landfall by Horizontal Direction Drilling (HDD);
- Onshore cables laid within open cut trenches or installed in ducts, and associated infrastructure including transition bays and jointing bays;
- Trenched or trenchless crossing of roads and sensitive features and habitats (e.g. sites of conservation importance);
- Onshore cable route haul road;
- Onshore cable route and substation construction access haul road;
- Temporary construction access roads;
- Substation operational access road;
- Construction consolidation sites;
- Onshore substation;
- National Grid substation;
- National Grid overhead line realignment works; and
- Landscaping and ecological mitigation associated with the onshore infrastructure and in particular, the onshore substations.

7. Further details on the key components of the offshore and onshore infrastructure can be found in ***Chapter 6 Project Description***.

4.3 Legislation, Policy and Guidance

4.3.1 Environmental Impact Assessment Regulations

8. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require an Environmental Statement (ES) to include "*a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the 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*".

9. This chapter addresses the requirement to set out reasonable alternatives.

4.3.2 National Policy Statement EN-1

10. NPS EN-1 is clear that "*from a policy perspective this NPS EN-1 does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option*". It does however note that in the execution of a competent EIA "*applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied."*

4.3.3 National Policy Statement EN-3

11. The NPS for Renewable Energy Infrastructure EN-3 states that the "*specific criteria considered by applicants and the weight they give to them will vary from project to project… The choices which energy companies make in selecting sites reflect their assessment of the risk that the IPC* [now the Examining Authority and Secretary of State]*, …will not grant consent in any given case. But it is for energy companies to decide what applications to bring forward and the Government does not seek to direct applicants to particular sites for energy infrastructure."* NPS EN-3 outlines that the IPC (now the Examining Authority and Secretary of State) should be satisfied that the site selection process has been undertaken in a way that reasonably minimises adverse effects on a variety of environmental parameters. This chapter addresses the requirement to demonstrate that the site selection process has minimised adverse effects.

4.3.4 National Policy Statement EN-5

12. The NPS for Electricity Networks Infrastructure EN-5 states that "*the choices which energy companies make in selecting sites reflect their assessment of the risk that the IPC* [now the Examining Authority and Secretary of State]*, following the principles set out in paragraph 4.1.1 of EN-1, will not grant consent in any given case."*

4.3.5 Marine Policy Statement

13. 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.

14. The East Inshore and East Offshore Marine Plans (Defra 2014) encompass the offshore development area and state *"Proposals for Offshore Wind Farms Inside Round 3 zones, including relevant supporting projects and infrastructure, should be supported"* (HM Government 2014).

4.3.6 Planning Inspectorate Advice Note Seven

15. The Planning Act 2008 (as amended), and related secondary legislation, establishes the legislative requirements in relation to applications and proposed applications for orders granting development consent for Nationally Significant Infrastructure Projects (NSIPs).

16. Planning Inspectorate Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (The Planning Inspectorate 2017) suggest the EIA needs to explain "*the reasonable alternatives considered and the reasons for the chosen option considering the effects of the Proposed Development on the environment*". This chapter addresses the requirement to explain the reasons for chosen option in light of reasonable alternatives.

4.3.7 Electricity Act 1989

17. The Electricity Act 1989 states that, in formulating the relevant proposals consideration must be given to the preservation of natural beauty, flora and other environmental features including cultural heritage. Furthermore, consideration must be given to what reasonable mitigation can be applied to such environmental effects.

4.4 Site Selection Process and Consideration of Alternatives

4.4.1 Overview of Site Selection Process

18. The siting, design and refinement of the proposed East Anglia TWO project has followed a site selection process, taking account of environmental, physical, technical, commercial and social considerations and opportunities as well as engineering requirements using the siting and cable routeing principles discussed and agreed with the Site Selection Expert Topic Group (ETG) (see ***section 4.9.1.2.1*** for those site selection principles). The aim was to identify a site that would be environmentally acceptable, deliverable and consentable, whilst also enabling, in the long term, benefits of the lowest energy cost to be

passed onto the consumer. 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 / topic consultants whose expertise was drawn upon throughout the site selection process.

19. Each stage of the site selection process forms part of an iterative design process undertaken to identify the most suitable locations and configuration, taking account of environmental, physical, technical, commercial and social considerations and opportunities as well as engineering requirements. The framework for the site selection process is based upon a set of design principles and engineering requirements for the proposed East Anglia TWO project infrastructure.

20. The Applicant has undertaken extensive pre-application engagement with stakeholders, communities and landowners in order to both seek input to refine the proposed East Anglia TWO project design, and to communicate decisions on refinements. ***Section 4.7*** to ***section 4.9*** of this chapter sets out the process followed in defining the onshore infrastructure and offshore infrastructure for the proposed East Anglia TWO project. This process established a series of search areas for the offshore cable corridor, landfall, onshore cable corridor, onshore substation and National Grid infrastructure.

4.4.2 Project Alternatives

21. A number of strategic-level project design alternatives have been considered as part of the site selection and project design decision-making process. The strategic consideration of alternatives which fed directly into the proposed East Anglia TWO project's site selection process is detailed in ***Table 4.1***.

Table 4.1 Strategic-level Project Design Alternatives Considered

Alternatives Considered	Decision	Main Environmental Benefits
Strategic approach to delivering the proposed East Anglia TWO project and the proposed East Anglia ONE North project within the same timeframe. OR No elements of the proposed East Anglia ONE North project considered within the design envelope for the proposed East Anglia TWO project.	To take a strategic approach to delivering the proposed East Anglia TWO project and the proposed East Anglia ONE North project within the same timeframe.	Co-location of onshore substations (i.e. the proposed East Anglia TWO onshore substation, the proposed East Anglia ONE North onshore substation and the National Grid substation) will keep these developments contained within a localised area and, in so doing, will contain the extent of potential impacts.

Alternatives Considered	Decision	Main Environmental Benefits
Overhead lines along the onshore cable route from landfall to grid connection location. OR Buried onshore cables along the onshore cable route from landfall to grid connection location.	Buried onshore cables	The environmental benefits of burying cables as opposed to overhead lines and pylons is the minimisation of visual impacts.
HDD of the onshore cables from offshore to onshore at landfall OR Open trench cut and direct lay of offshore cables from offshore to onshore at landfall.	HDD of the offshore cables from offshore to onshore	The environmental benefit of HDD at the landfall removes any possible interaction with the Sizewell Beach SSSI and reduces potential risks associated with coastal cliff erosion in the Thorpeness area – an area with high cliff instability.
Onshore cable route takes shortest direct route through Sandlings SPA (shorter onshore cable route but through longer section of SPA) OR Onshore cable route crosses at narrowest section of Sandlings SPA (longer onshore cable route but through shorter section of SPA)	Onshore cable route crosses at narrowest section of Sandlings SPA (longer onshore cable route but through shorter section of SPA)	The environmental benefit of crossing the Sandlings SPA at its narrowest section reduces the potential impacts to habitats within, and disturbance to, species using the SPA.
Selection of Gas Insulated Switchgear (GIS) transformer technology for the onshore substation. OR Selection of AIS transformer technology for the onshore substation.	Selection of Gas Insulated Switchgear (GIS) transformer technology for the onshore substation	Environmental benefit of the East Anglia TWO Limited Gas Insulated Switchgear (GIS) transformer technology is that it allows for a lower building height within the onshore substation, minimising the visual impacts.

4.5 Consultation

4.5.1 Public and Landowner Consultation

22. Consultation is a key feature of the EIA process, and continues throughout the lifecycle of a project, from its initial stages through to consent and post-consent.

23. Consultation on refinements to the proposed East Anglia TWO project's site selection, layout and configurations has been undertaken through the informal

and formal pre-application stages, including the formal submission of the Scoping Report (SPR 2017) in November 2017 and the PEIR in February 2019 (SPR 2019). A summary of the range of measures adopted during consultation are presented below; agreed through the Statement of Community Consultation (SoCC), and summarised in the Consultation Report (document reference 5.1):

- Public Information Days (PIDs) held at locations within and adjacent to the proposed onshore development area;
- Phase 1 consultation (October / November 2017) with statutory consultees and the public;
- Phase 2 consultation (March / April 2018) with statutory consultees and the public;
- Phase 3 consultation (May to August 2018) with statutory consultees and the public;
- Phase 3.5 consultation (September to November 2018 and including four community engagement events held in October 2018) with statutory consultees and the public;
- Phase 4 consultation (February / March 2019) with statutory consultees and the public (including publication of the Preliminary Environmental Information Report (PEIR) and Section 42 consultation with statutory consultees);
- Public Information Day summary reports shared with all registered participants, key local and community stakeholders, and on the proposed East Anglia TWO project website for Phase 2, Phase 3, Phase 3.5 and Phase 4 community engagement events;
- Parish Council briefings;
- Direct discussions with landowners:
  - The Applicant and the Applicant's land agents have met affected landowners and / or their appointed land agents. A number of preferences for the routeing of the onshore cable route have been put forward by those affected by the proposed onshore development area and a number of those suggestions have been incorporated into the proposed onshore development area boundary;
  - The Applicant has engaged with landowners regarding survey access through consultation meetings. Letters were sent to all affected parties offering to meet to discuss the proposed East Anglia TWO project proposals;
- Newsletters distributed throughout the onshore substation(s) site selection study area;
- Dedicated project e-mail address and freepost address to assist local communities in contacting the Applicant;

- Provision of a dedicated proposed East Anglia TWO project website; and
- Regular and targeted discussion with regulators and other stakeholder bodies through various means including over 35 ETG meetings (with others planned for Autumn 2019), where the siting of onshore and offshore infrastructure was discussed in detail. More information is detailed in ***section 4.5.2***.

4.5.2 Consultation on Site Selection

24. Consultation regarding site selection and assessment of alternatives has been conducted through various means including a Site Selection ETG, through responses to the Scoping Report (SPR 2017) and the PEIR (SPR 2019) and the consultation events and process as outlined in ***section 4.5.1.***

25. ***Appendix 4.1*** details statutory consultee responses to all phases of consultation undertaken prior to publishing this ES, pertaining to site selection and assessment of alternatives. All non-statutory consultation, including responses from members of the local community, has been addressed separately by the Applicant and is contained within the Consultation Report (document reference 5.1) submitted with the Development Consent Order (DCO) application. Consideration of local community comments has been undertaken throughout the site selection process, as detailed within this chapter.

26. The Applicant has engaged in site selection discussions regarding the onshore and National Grid substation site(s) via meetings, site visits and workshops with a Site Selection ETG since July 2017. These meetings included the monthly project management Local Planning Authority meetings; and at the Suffolk Energy Projects Working Together meetings. The Site Selection ETG comprised Suffolk County Council, Suffolk Coastal and Waveney District Council (now East Suffolk Council), Natural England, Historic England, the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB), the Environment Agency and National Grid Electricity Transmission. The Site Selection ETG met on the dates as outlined in ***Table 4.2***.

Table 4.2 Site Selection Meetings, Site Visit and Workshops with Statutory Consultees

Date	Attendees	Topics covered
7th July 2017	Suffolk County Council Suffolk Coastal and Waveney District Council	• Move to connection point in the vicinity of Leiston and Sizewell
24th July 2017	Suffolk County Council Suffolk Coastal and Waveney District Council	• Site selection principles • Landfall area • Initial onshore substation(s) site selection study area (east of Aldeburgh Road)

Date	Attendees	Topics covered
		• Site selection constraints associated with Sizewell A and B
20th September 2017	Suffolk County Council Suffolk Coastal and Waveney District Council	• National Grid substation • Western extension of onshore substation(s) site selection study area • Sizewell A – further clarifications • Crossing Aldeburgh Road (interaction with property / woodland) • Substation zones (west of Aldeburgh Road)
1st December 2017	Suffolk County Council Suffolk Coastal and Waveney District Council	• RAG assessment • Eastern substation zones site visit
6th February 2018	Suffolk County Council Suffolk Coastal and Waveney District Council	• Offshore geology – Coralline Crag • Offshore export cable corridor routeing • Landfall consideration of alternatives and preferred location
20th February 2018	Natural England Environment Agency Historic England Suffolk Coast and Heaths AONB National Grid Suffolk County Council Suffolk Coastal and Waveney District Council	• National Grid substation • Western extension of Onshore Site Selection Study Area • Sizewell A • Crossing Aldeburgh Road (interaction with property / woodland) • Substation zones (west of Aldeburgh Road) • RAG assessment • Eastern substation zones site visit
21st February 2018	Natural England Environment Agency Historic England Suffolk Coast and Heaths AONB National Grid Suffolk County Council Suffolk Coastal and Waveney District Council	• Onshore substation height reduction • AONB special qualities impact appraisal • Engineering feasibility of crossing Aldeburgh Road • Updated RAG assessment • Western substation zones site visit
23rd May 2018	Suffolk County Council Suffolk Coastal and Waveney District Council Environment Agency	• Offshore geology – Coralline Crag • Offshore export cable corridor routeing • Landfall consideration of alternatives and preferred location

Date	Attendees	Topics covered
7th June 2018	Natural England Environment Agency Historic England Suffolk Coast and Heaths AONB Suffolk County Council Suffolk Coastal and Waveney District Council	• Communicate decision-making regarding choice of Substation Zone 7 • Feedback on public consultation to date • Indicative Onshore Development Area • Landfall (technical discussions) • Historic setting at Aldeburgh Road crossing • Micro-siting of substation arrangements • National Grid overhead line works • Surveys

4.6 Development of the Proposed East Anglia TWO Project Offshore and Onshore Development Areas

27. Identification and refinement of the proposed East Anglia TWO project offshore and onshore development areas has been informed by the following key factors:

- The selection of the Round 3 Zone 5 (renamed the East Anglia Zone) by The Crown Estate, and subsequent award of the Zonal Development Agreement (ZDA) to East Anglia Offshore Wind[1] (EAOW) (see ***section 4.7.1***);
- The Zone Appraisal and Planning (ZAP) process which identified the areas of least constraint for windfarms within the former East Anglia Zone (see ***section 4.7.2***);
- The grid connection agreement between the Applicant and National Grid signed on 21st December 2017, which identified "in or around Leiston" as the grid connection point, and therefore enabled identification of offshore and onshore cable corridors and the onshore substation location for the onshore substation and associated National Grid substation (see ***section 4.7.5***);
- Consultation with statutory and non-statutory consultees from the outset of the proposed East Anglia TWO project via a Site Selection ETG (see ***section 4.5***); and
- Consultation with the public including landowner interests via PIDs, Parish Council Briefings, community engagement events and distributed leaflets, newsletters and materials regarding updates to the project (see ***section 4.5***);
- Review of environmental constraints and planning policy which led to the refinement of the East Anglia TWO windfarm site (see ***section 4.7.3***), offshore cable corridor (see ***section 4.7.6***) and onshore cable corridor (see ***section***

[1] The original joint venture between ScottishPower Renewables (SPR) and Vattenfall – see ***Chapter 1 Introduction*** for further details.

4.9.2), the landfall location (see ***section 4.8***), the onshore substation, and associated National Grid substation location (see ***section 4.9.1***).

28. The site selection process and consideration of alternatives for the proposed East Anglia TWO project included consideration of the proposed East Anglia ONE North project, specifically in relation to the offshore cable corridor, landfall, onshore cable corridor, onshore substation location and National Grid substation location.

29. The process of refining wider areas of search to determine the onshore development area was an iterative one, requiring environmental, legal, planning, land and engineering input at an increasingly detailed scale using the siting and cable routeing principles discussed and agreed with the Site Selection ETG (see ***section 4.9.1.2.1*** for those site selection principles), plus input from National Grid Electricity Transmission. Refinements were consulted upon with Local Planning Authorities and key stakeholders at various stages and consulted upon with the public via PIDs and Parish Council briefings (***section 4.5***).

30. Each stage of the iterative site selection process is shown in ***Plate 4.1*** and is described in more detail below.

Plate 4.1 Site Selection Refinement for the Proposed East Anglia TWO Project by Work Phase or Consultation Phase

4.7 Offshore Site Selection and Alternatives

4.7.1 Initial Offshore Zone Selection

31. The former East Anglia Zone was originally identified as a suitable area offering 'potential for offshore wind' by The Crown Estate as part of the Round 3 Offshore Wind Zone tendering process in 2008. The Crown Estate used their Marine Resource System (MaRS) Geographic Information System (GIS) tool to identify suitable areas for offshore windfarm development. The Round 3 Zones were identified in an iterative process that took account of a number of constraints imposed by existing or future use of the sea.

32. The Crown Estate Round 3 Zones were the subject of the Offshore Energy Strategic Environmental Assessment (OESEA) undertaken in 2008 / 2009. The OESEA was prepared to assess the implications of further rounds of offshore windfarm leasing in the UK Renewable Energy Zone and the territorial waters of England and Wales, as well as the implications of other industry activities. The assessment covered ecological, physical and human environmental factors including heritage and seascape and landscape effects. The results of this strategic level analysis showed that the zones represent suitable 'areas of opportunity' for offshore wind projects, and have the ability to deliver the required capacity of offshore wind within acceptable environmental limits. It was however recognised that there may be local or regional constraints to the development of offshore wind projects within the zone boundaries.

33. In 2010, The Crown Estate announced the successful bidders to the Round 3 offshore windfarm zones. EAOW was successful in securing, what was later to be called, the East Anglia Zone, committed to developing 7.2GW of offshore wind renewable energy. After successfully obtaining consent and a Contract for Difference (CfD) for East Anglia ONE, and successfully submitting the application for consent for East Anglia THREE (now consented), SPR and Vattenfall split the former East Anglia Zone. SPR agreed to develop the southern half of the former East Anglia Zone and Vattenfall agreed to develop the northern half of the former East Anglia Zone. SPR has a majority share in East Anglia ONE and is responsible for the construction, operation and maintenance of the project, and is solely responsible for East Anglia THREE, the proposed East Anglia TWO and proposed East Anglia ONE North projects

4.7.2 Zone Appraisal and Planning

34. The ZAP Process was introduced by The Crown Estate as a way of managing how development was taken forward across individual zones (The Crown Estate 2014). It was a non-statutory strategic approach to zone design, project identification and consenting for each of the Round 3 Zones. The main aims of the ZAP process were to:

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

35. The ZAP process for the former East Anglia Zone comprised two key elements:

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

36. The ZAP Process was based upon a number of site specific surveys (for example, ornithological surveys and benthic surveys) and desk-based assessments of publicly available and historical data. The key constraints considered in the ZEA and ZTA were:

- Civil and military radar coverage and helicopter main routes;
- Infrastructure;
- Benthic habitats (including those listed Annex I of the Habitats Directive);
- Seascape and visual amenity;
- Commercial and natural fisheries activity;
- Ornithology;
- Conservation designations;
- Shipping and navigation;
- Marine archaeology;
- Physical processes; and
- Underwater noise.

37. The ZAP Process also considered the following hard constraints to development within the former East Anglia Zone:

- Oil and gas platforms and pipelines;
- Active subsea cables;

- International Maritime Organisation (IMO) Deep Water Routes; and
- Naval maritime graves.

38. These hard constraints were treated as barriers to development (i.e. the areas affected were treated as unsuitable for wind turbines).

39. From the review of the initial baseline data, 11 potential Development Areas were identified as the least constrained parts of the former East Anglia Zone. These areas were further assessed by EAOW in order to identify a smaller number of preferred development areas.

4.7.3 Site Specific Selection - Windfarm Site Boundary

40. The East Anglia TWO windfarm site boundary, former East Anglia Zone and other projects being developed within the former East Anglia Zone can be seen in ***Figure 4.1.***

41. The ZAP process outlined above identified a broad area for the proposed East Anglia TWO project as being an area with a relatively low number of development constraints, both technical and environmental. Those constraints that were highlighted were similar to those highlighted for East Anglia ONE and East Anglia THREE. It is considered that the ZAP process did not highlight any major constraints within the East Anglia TWO windfarm site that would prevent development. As such this site was chosen by SPR to be taken through the consenting process.

42. The East Anglia TWO windfarm site boundary has been selected on the basis of the ZAP process detailed above and further consideration of development potential carried out by the Applicant. The shape of the East Anglia TWO windfarm site boundary was informed by surrounding constraints. The boundary was delineated by the Outer Thames Estuary SPA to the North, proximity to East Anglia ONE (11km east), shipping and navigation activity, as well as the proximity to Galloper Windfarm to the south (approximately 6.5km) and the former East Anglia Zone boundary to the west (which was beyond 12 nautical miles from the coast as per the seascape constraint as set out in the OESEA). This boundary was presented and consulted upon in the PEIR.

4.7.4 Revision to the Windfarm Site Boundary

43. Following the PEIR consultation, the final site selection refinement stage (see ***Plate 4.1***) was carried out according having regard to the following factors:

- Engineering study results;
- Energy yield analysis; and

- The potential to reduce seascape impacts.

44. The final refinement following consultation on the PEIR was carried out in the light of key factors of seascape and landscape. With regard to seascape impacts, responses particularly focussed on the spread of wind turbines on the horizon as seen from the coast and the potential for cumulative impact with other projects. The Applicant therefore sought to determine if it was possible to reduce the area of the East Anglia TWO windfarm site, and its lateral spread, whilst maintaining commercial viability on the basis of the original generation capacity and wind turbine generator envelope. The north-south extent of the East Anglia TWO windfarm site was subsequently reduced (by 9.68km on the western boundary and 8.03km on the east) in order to mitigate potential seascape impacts, without a reduction in wind turbine numbers or generation capacity. The windfarm boundary was reduced by a total area of 37km^2 This refinement is shown in ***Figure 4.3***.

45. The final site selection refinement aimed to reduce the magnitude of change on seascape, landscape and visual receptors and on the setting and key coastal viewpoints within the AONB. ***Chapter 28 Seascape, Landscape and Visual Amenity,*** confirms that, while a reduction in the defined magnitude of impact (i.e. low / medium / high) has not occurred from all viewpoints, this refinement has resulted in a reduction in magnitude of change (see ***Chapter 5 EIA Methodology***) from all viewpoints resulting from:

- East Anglia TWO windfarm site reduced lateral spread
- Concentrated grouping of turbines
  - Reduced effects due to the revised layout forming a denser, more concentrated and consistent grouping of turbines than the 'spread-out' and more varied spacing of the PEIR layout.
- Increased distance offshore
  - For viewpoints to the north of the AONB in particular, there is an increased distance to the offshore windfarm site boundary (e.g. 3km further at Covehithe; 2km further at Southwold).
- Cumulative effects
  - Primarily due to the increase in open sea horizon or gap between the East Anglia TWO and East Anglia ONE North windfarm sites; which increases the legibility of each as a windfarm in its own right (rather than visually merging to form one larger array).

46. This refinement also resulted in an increase in distance of the East Anglia TWO windfarm site from the Outer Thames Estuary SPA (see ***Chapter 12 Offshore Ornithology*** and the ***Information to Support Appropriate Assessment*** for further details).

4.7.5 Grid Connection Location

47. National Grid owns the England and Wales electricity transmission network. This network carries electricity from generators to substations, where the voltage is lowered, ready for distribution to homes and businesses. In order to connect to the electricity transmission network, the Applicant has entered into a grid connection agreement with National Grid. The following section presents work undertaken jointly with National Grid in determining the grid connection location offered the Applicant.

48. An important element of this assessment is the cost that will be passed on to the consumer (the public and businesses) as a result of the works which will be required to ensure the network can accommodate the proposed East Anglia TWO project. As part of the economic assessment, the Connection and Infrastructure Options Note (CION) Process 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.

49. The CION Process is the mechanism used by National Grid to evaluate (in the case of the proposed East Anglia TWO project) the potential options for connecting to the transmission system. This leads to the identification and development of the overall efficient, coordinated and economical connection point and onshore connection design, in line with the obligation to develop and maintain an efficient, coordinated and economical system of the electricity transmission network (including consideration of environmental matters and mitigating effects on those resources – see ***Table 4.3***).

50. Guidance Note Issue 3 (National Grid 2018) explains how the CION assessment is carried out. The process looks at technical, commercial, regulatory, environmental, planning and deliverability aspects to identify the preferable connection for the consumer. The Electricity Act 1989 requires National Grid to develop and maintain an efficient, co-ordinated and economical system of electricity transmission whilst also in formulating relevant proposals having due regard to environmental matters and mitigating effects on those resources. When the development being connected is offshore, such as a windfarm, the offshore aspects need to be considered in that evaluation too. The assessment process therefore looks to minimise the total capital and operational cost whilst taking into account other key considerations, as set out above.

51. The total cost of connecting to each location is worked out based on Transmission Capital Costs + Developer Capital Costs + System Operator Constraint Costs. Constraint Costs are the costs of increasing generation from some power stations and decreasing it at others to balance the system. It then considers how the various options compare in cost terms against a range of future energy scenarios, which is known as the cost benefit analysis (CBA) process. Through the CBA a recommended option is identified in economic terms. The costs of the options are then evaluated against the other key considerations (including environmental matters and mitigating effects on those resources) to determine the preferred grid connection option, which can change as more detailed information is obtained.

52. In 2010, EAOW signed grid connection agreements with National Grid for six 1.2GW offshore wind projects. The connection offers were based on the existing and contracted generation background at that time which included the capacity and proposed timing of Sizewell C amongst others. At that time, the most economic and efficient connections (considering environmental and programme implications) were identified at Bramford for the East Anglia ONE, East Anglia TWO and East Anglia THREE projects. There was no available capacity near Sizewell to accommodate the projects at that time.

53. SPR and National Grid have regular meetings and they also assess and publish long term grid development statements annually. In 2016, SPR took full ownership of the East Anglia ONE and THREE projects and identified the proposed East Anglia TWO and East Anglia ONE North projects as the next projects to be brought forward for development consent. SPR engaged with National Grid in early 2017 to determine connection options for the proposed East Anglia TWO and East Anglia ONE North projects based on contracted background at that time and reflecting the projects' timescales and reduced capacities. This resulted in the CION review process.

54. In parallel with this process, the Applicant began preliminarily engaging with key stakeholders regarding potential onshore cable routeing, on the basis of the original connection agreement, to Bramford.

55. Any changes to the contracted generation background can trigger a CION review. The changes within the former East Anglia Zone and the newly defined East Anglia TWO and East Anglia ONE North projects initiated a CION review of the original connection agreements. The CION review considered all realistic possible connection points.

56. In spring 2017, National Grid advised that due to the changing contracted background, connection capacity could be available in the Sizewell / Leiston area.

The CION process (as outlined above at the start of ***section 4.7.5***) reviewed all realistic options and in summer 2017 concluded that the most economic and efficient connections for East Anglia TWO and East Anglia ONE North, while considering environmental and programme implications, would be into the circuits in or around Leiston.

57. ***Table 4.3*** is an extract from the CION Note (National Grid 2016). It provides information on the strategic level environmental considerations as part of the CION process.

Table 4.3 Summary of the Environmental Considerations of the Preferred Option Assessment within the CION process (extract from National Grid (2016) report)

Option	Substation	Landfall / offshore	Onshore
Option 1: connecting to Bramford 400kV substation via HVAC link	There are no high-level environmental designations at the existing Bramford substation. Cumulative noise and visual impacts could be significant. It is noted that the area already has notable electricity infrastructure planned.	Landing points in the vicinity of the existing Sizewell site have impacts on the Suffolk coast and Heaths AONB; however East Anglia ONE has connected in this location so it is assumed that a landfall would be possible. A suitable landfall location has been identified from a consenting perspective.	Significant environmental constraints are evident on the south Suffolk coast, careful mapping following East Anglia ONE / East Anglia THREE route could avoid designations.
Option 2: connecting to Sizewell 400kV substation via HVAC link	The existing Sizewell substation is surrounded by the Suffolk Coast and Heaths AONB. On the basis that a substation is already present, and new substations are being constructed in the area this has been marked green, assuming that a new substation could be accommodated in the landscape. In addition, there are areas suitable out with the AONB, should the existing substation site be too constrained.	Landing points in the vicinity of the existing Sizewell site have impacts on the Suffolk coast and Heaths AONB; however, Galloper and Greater Gabbard have connected in this location so it is assumed that a landfall would be possible. A suitable landfall location has been identified from a consenting perspective.	Cable routes to the Sizewell site would have impacts on the Suffolk coast, will impact the Heaths AONB and could impact an SPA; however, a precedent has been set by Galloper and Greater Gabbard and careful routeing would minimise potential impacts.
Option 3: connecting to Leiston 400kV substation via HVAC link	The existing Sizewell substation is surrounded by the Suffolk Coast and Heaths AONB. On the basis that a substation is already present, and new substations are being constructed in the area this has been marked green, assuming that a	Landing points in the vicinity of the existing Sizewell site have impacts on the Suffolk coast and Heaths AONB; however, Galloper and Greater Gabbard have connected in this location so it is assumed that a landfall would be possible. A	Cable routes to the Sizewell site would have impacts on the Suffolk coast, will impact the Heaths AONB and could impact an SPA; however, a precedent has been set by Galloper and Greater Gabbard and careful

Option	Substation	Landfall / offshore	Onshore
	new substation could be accommodated in the landscape. In addition, there are areas suitable outwith the AONB, should the existing substation site be too constrained.	suitable landfall location has been identified from a consenting perspective.	routeing would minimise potential impacts.
Option 4: connecting to Norwich Main 400kV substation via HVAC link	There are no high-level environmental designations at the existing Norwich Main substation. There are potentially cumulative noise and visual impacts which could be significant. It is noted that the area already has notable electricity infrastructure present.	Potential landfall sites between Sea Palling (very constrained technically) and south of Mundesley (Vattenfall proposed landfall for 3 projects) outwith the National Park (Norfolk Broads), however numerous constraints increase consenting risk. Offshore constraints include: 1. Recommended marine conservation zone between Cromer and Happisburg inshore. 2. Haisborough, Hammond and Winterton SAC which is located directly between thezone and potential landfall points. 3. Dense Sabellaria south of Hammond Knoll. 4. Large number of offshore pipelines	Nationally significant designations to the east of Norwich including Norfolk Broads National Park which would be a considerable challenge in terms of a direct route to the substation. However, there are routes available to the North and then west of Norwich but considerable circuit lengths would be required. Numerous constraints along the route but can be mitigated by careful routeing and / or engineering design e.g. HDD.
The preferred option is Option 3 where the 860MW of wind generation in East Anglia TWO and / or East Anglia ONE North is connected to the onshore IP at Leiston. The current design consideration is for a single 860MW collector platform. This substation will step up the voltage from 33 or 66kV (depending on the array voltage). This will utilise two 504MVA transformers. An onshore substation of 860MW OFTO substation will be built adjacent to the Leiston substations. The offshore platform and onshore substation will be connected via two 220kV HVAC circuits. 400kV underground cables will connect the OFTO substation to the Leiston substation.			

4.7.6 East Anglia TWO Offshore Cable Corridor

58. The offshore cable corridor has been developed to facilitate connection between the grid connection location in the vicinity of Sizewell and Leiston (as outlined in ***section 4.7.5)*** and the East Anglia TWO windfarm site. The offshore cable corridor has been refined through several phases as more information has become available and consultation with stakeholders has progressed. The

following sections outline the process undertaken during the development of the offshore cable corridor.

4.7.6.1 Phase 1 – Identification of Scoping Area of Search

59. An offshore cable corridor Area of Search (AoS) was developed to inform the Scoping Report (SPR 2017). The development of the AoS was informed through consideration of hard and soft environmental and engineering constraints both offshore and at the landfall.

60. A preliminary exercise was undertaken to identify all known constraints in proximity to the East Anglia TWO windfarm site and Suffolk coast near Sizewell and Thorpeness to identify broad corridors from the East Anglia TWO windfarm site to a grid connection point in the vicinity of Sizewell and Leiston. At this stage of the process, it was considered that a joint corridor serving both the proposed East Anglia TWO and East Anglia ONE North projects would be the preferred option, as a strategic-level decision outlined in ***Table 4.1*** to co-locate the onshore substations.

61. In addition to offshore constraints, this exercise was informed by a separate exercise that considered viable landfall locations that would provide access to a grid connection point in the vicinity of Sizewell and Leiston (***section 4.8***).

62. The identification of potential offshore cable corridors followed the principles identified below during the preliminary stage:

- Routeing options needed to be able to connect to viable landfall locations;
- Ability to route the proposed East Anglia TWO and East Anglia ONE North projects' offshore export cables in a single route (a minimum corridor of 2,000m was assumed);
- The number of existing pipeline and cable crossings were minimised as far as possible; and, where a crossing was required, cables and pipelines to be crossed at 90° where possible;
- Historic wrecks were avoided as far as possible;
- Sea bed take in aggregate dredging areas was minimised;
- Avoidance of the Southwold Oil Transhipment Area (one of the UK's ship-to-ship transfer areas)[2];
- Avoidance of designated sites as far as possible; and

[2] "Ship-to-ship transfer" is generally used to describe the transfer of oil, carried as cargo, from one tanker to another tanker. It can also be used to describe transfers of substances other than oil, but oil transfers are the most common by far.

- Avoidance of ecologically important sandbanks and potential reefs as far as possible.

63. Routeing options that were identified were then reviewed with regard to The Crown Estate guidance on the principles of cable routeing and spacing (The Crown Estate 2012).

64. It was not possible to avoid the Southern North Sea Special Area of Conservation (SAC) and Outer Thames Estuary Special Protection Area (SPA) as the SAC encompasses the whole offshore development area and the SPA forms a strip along the coast covering parts of the offshore cable corridor and the landfall (see ***Figure 9.14***). It was also identified that due to constraints at the landfall, it would not be possible to avoid spatial overlap with the Leiston to Aldeburgh Site of Special Scientific Interest (SSSI) and therefore it is intended that interactions with the SSSI will be avoided through construction methodologies which avoid physical impacts to the SSSI.

65. The exercise outlined above identified an initial 2,000m wide joint corridor for both the proposed East Anglia TWO and East Anglia ONE North projects. However, the East Anglia TWO windfarm site is bisected by the offshore cable corridor for East Anglia ONE and East Anglia THREE which will influence how the windfarm site is ultimately developed and therefore its offshore export cable requirements. It was therefore decided that the option for an offshore cable corridor to the south of the East Anglia ONE/East Anglia THREE offshore export cable corridor needed to be maintained.

66. It was also decided that a single offshore cable corridor shared between the proposed East Anglia TWO and East Anglia ONE North projects would potentially restrict electrical infrastructure options as the proposed East Anglia TWO and East Anglia ONE North projects may be progressed separately. The decision was made that separate offshore cable corridors with a shared landfall should be developed.

67. Further refinements to the routeing of the offshore cable corridor were then undertaken. The principles guiding the refinements were the same as those that informed the initial exercise. For this exercise it was determined that, in line with The Crown Estate guidance (2012), that minimum offshore cable corridor widths of 1,050m for a single project consisting of two offshore export cables and 1,600m for a shared offshore cable corridor consisting of four export cables should be used. In order to minimise sea bed take, these offshore cable corridor widths were maintained as far as possible, however, in areas where environmental or engineering constraints were identified the offshore cable corridor was widened to allow for sufficient flexibility and space for installation.

68. The result of this process identified two potential offshore cable corridor routeing options for the East Anglia TWO windfarm site which allowed for connection either to north (northern route) or south (southern route), with both routes having a common landfall and approach to landfall. Both these routes have been included within the DCO application and a final decision on which route will be taken forward to construction will be made post-consent once detailed geophysical information is obtained and layout of the East Anglia TWO windfarm site is finalised. The option chosen would represent the most economic and efficient in relation to the final wind turbine layout proposed. A description of separate selection considerations for the northern and southern cable corridor routes are provided below. The results of this routeing exercise and constraints are presented in ***Figure 4.2***.

4.7.6.1.1 Northern Route

69. The offshore cable corridor northern route for the proposed East Anglia TWO project was developed to be adjacent to the proposed East Anglia ONE North project offshore cable route. The offshore cable corridor route is wide enough to accommodate cables for both the proposed East Anglia TWO and East Anglia ONE North projects.

70. Moving offshore from the shared approach to landfall, the northern route, passes north of the Southwold Oil Transhipment Area (with a minimum buffer of 2,000m) and Southwold East aggregates dredging area and follows the former northern boundary of the East Anglia TWO windfarm site and then bends southward to connect to the East Anglia TWO windfarm site (in an area formerly part of the windfarm site which was removed post-PEIR, see ***section 4.7.4*** and ***section 4.7.6.2.1***).

71. Geophysical and benthic survey undertaken as part of the former East Anglia zone ZEA and North Sea aggregates industry Regional Environmental Characterisation (REC) identified potential areas of *Sabellaria spinulosa* reef to the north of the Southwold Oil Transhipment Area and Southwold East aggregates area. The northern route is broader at this point to allow flexibility to micro-site as required to avoid or minimise disturbance to *Sabellaria* reef that may be present. Due to the transient nature of *Sabellaria* reef, confirmation of reef presence, as well as detailed cable routeing and micro-siting will be informed by pre-construction geophysical survey.

72. Whilst the number of wrecks within the offshore cable corridor was minimised as far as possible, there are several wrecks within the boundary of the northern route. A deviation to the northern route to reduce the number of wrecks was made after the submission of the Scoping Report (discussed in ***section 4.7.6.2***), and

there is sufficient width within the offshore cable corridor to avoid wrecks that remain by micro-siting.

4.7.6.1.2 Southern Route

73. The offshore cable corridor for the proposed East Anglia TWO project southern route was developed based on an offshore cable corridor width suitable for cables of a single project to be installed and includes a widened strip adjacent to the west of the East Anglia TWO windfarm site so that the offshore export cable can connect to offshore electrical platforms in the southern half of the East Anglia TWO windfarm site, if required. The southern route passes through an area where there are a number of known wrecks and the minimum width used for the offshore cable corridor southern route would also provide suitable flexibility for micro-siting to avoid wrecks or sensitive ecological features if required.

74. The southern route was developed to pass to the south of the Southwold Oil Transhipment area with a minimum buffer of 1,500m (although later refinements discussed in ***section 4.7.6.2.1*** have now increased this buffer to over 5,000m). The southern route passes to the south of the Southwold Aggregate area, to the north of the East Anglia ONE/East Anglia THREE offshore cable corridor where it joins the East Anglia TWO windfarm site. A section of offshore cable corridor was included along the south western boundary of the East Anglia TWO windfarm site to provide access to southern areas of the site; however, this was later removed as discussed in ***section 4.7.6.2.1***.

4.7.6.1.3 Nearshore (Shared) Route

75. For the section of offshore cable corridor closest to landfall, minimum offshore cable corridor widths were calculated based on offshore export cables for both the proposed East Anglia TWO and proposed East Anglia ONE North projects being installed. This calculation factored in two offshore export cables being required for each of the proposed East Anglia TWO and East Anglia ONE North projects based on experience from East Anglia ONE.

76. The offshore cable corridor approach to landfall requires a bend in the offshore cable corridor as well as crossings of Galloper, Greater Gabbard and Concerto Seg-N cables in the nearshore area. The bend is necessary as avoidance of nearshore sandbanks and offshore constraints (described in ***sections 4.7.6.1.3, 4.7.6.2.2,*** and ***4.8.2***) prevent a more direct route being used. This is illustrated in ***Figure 4.4***. The offshore cable corridor was widened to allow sufficient flexibility for interactions with other utilities and to provide sufficient width for offshore cable installation vessels to manoeuvre and anchor safely. There is also an acute bend in the East Anglia TWO southern route, where it joins the shared approach. The southern route was restricted by the presence of known constraints, in particular, known archaeology. It was decided that additional offshore cable corridor width

was required to allow sufficient space for the acute bend to be accommodated. The offshore cable swathe was widened at this bend to provide sufficient width for the cable installation vessel to manoeuvre safely and anchor if required.

77. During the development of the offshore cable corridor, consultation was held with key stakeholders to ensure that all constraints were considered, with a briefing note sent to provide information on the offshore cable corridor and the intended approach to EIA.

78. Concerns were raised by EDF Energy, representing the Sizewell B Nuclear Power Station (and planned Sizewell C New Nuclear Power Station), and considered as part of the corridor routeing exercise. During EIA and Examination of the Galloper Wind Farm, EDF Energy raised a number of concerns to Galloper Wind Farm Limited (GWFL) with regard to the installation and maintenance of the Galloper offshore export cables, particularly nearshore. These same issues were considered in relation to the proposed East Anglia TWO project and were as follows:

- Stand-off distances between offshore export cables and Sizewell B and proposed Sizewell C cooling water intake infrastructure. The offshore cable corridor was routed to maintain a minimum separation distance of 500m with the Sizewell B and proposed Sizewell C intake infrastructure. This separation distance is fully compliant with EDF Energy's protective provision agreement with GWFL.
- Impacts on the quality of cooling water. In their Written Representation to the Examination (The Planning Inspectorate 2012), EDF Energy raised concerns about sediment suspended during Galloper offshore export cable installation and operational works reducing the quality of cooling water within the Sizewell B cooling system. To address this concern, the Applicant employed a larger 500m buffer between the offshore cable corridor and the intakes than the 300m agreed between EDF Energy and GWFL.
- Impacts on Coralline Crag during cable installation works. EDF Energy raised concerns with GWFL about the impact from cable trenching works on Coralline Crag geology near to Sizewell which includes subtidal rock formations. EDF Energy's primary concern was that installation works through the Coralline Crag could impact on the structural integrity of the sea defences at Sizewell and disturbance of coastal processes. In response to this, the Applicant has undertaken extensive work to refine the offshore cable corridor routeing to avoid potential impacts to the Coralline Crag. This work was not completed in time to inform the Scoping Report (SPR 2017), therefore a broad landfall AoS was used at that time. This work informed Phase 2 of the offshore cable corridor routeing process outlined in ***section 4.7.6.2***.

79. Note that since the publication of EDF Energy's Stage 4 consultation for Sizewell C New Nuclear Power Station (July 2019), the offshore boundary for that project has been moved seaward and there is potential for water cooling infrastructure to move further offshore as a result (see ***Figure 4.4***). Given that EDF Energy have yet to submit a DCO application with a final boundary (this is expected in early 2020), the Applicant does not propose to revise the offshore cable corridor for the proposed East Anglia TWO project. The Applicant will follow the progress of the Sizewell C New Nuclear Power Station proposals and continue to liaise with EDF Energy regarding potential interactions between the projects.

4.7.6.2 Phase 2- Refinements of Offshore Cable Corridor Since Scoping

80. Several refinements have been made to the offshore cable corridor since the submission of the Scoping Report (SPR 2017). The refinements have been made as a result of additional information becoming available, particularly relating to ongoing studies at the landfall and further consultation with the Crown Estate in relation to Area for Lease (AfL) applications. Generally, refinements of the offshore cable corridor fall into two categories;

- Refinements to the offshore cable corridor identified through consultation with The Crown Estate; and
- Refinements to the approach to landfall informed through further work on landfall site selection.

4.7.6.2.1 Refinements to Offshore Cable Corridor

81. In January 2018, the Applicant submitted an AfL application for the area of the offshore cable corridor. In response to the AfL, The Crown Estate requested further consideration of the southern route of the East Anglia TWO offshore cable corridor in relation to the following aspects:

- The southern route using part of an area previously licenced for aggregate extraction (which had not been specifically included within the Eastern Marine Plan); and
- Sterilisation of a section of sea bed between the joint East Anglia ONE/East Anglia THREE cable corridor and the proposed East Anglia TWO project southern route.

82. In response to these comments, the southern route was routed adjacent to the East Anglia ONE / East Anglia THREE cable corridor to avoid sterilisation of sea bed to aggregate extraction. A small section of the aggregates area is still within the offshore cable corridor southern route as it was necessary to include additional export cable corridor width to allow sufficient space for a bend and associated installation anchoring requirements to at this point. These updates are shown in ***Figure 4.4****.*

83. During this refinement, it was decided that the inclusion of a section of the southern route which follows the south west boundary of the East Anglia TWO windfarm site was no longer required to provide access to southern sections of the East Anglia TWO windfarm site as cabling would be routed within the East Anglia TWO windfarm site. This is illustrated in ***Figure 4.4.***

84. In addition to this update, a small amendment was made to the East Anglia TWO offshore cable corridor northern route. The reason for this adjustment was to allow two wrecks that were initially within the boundary of the offshore cable corridor to be fully outside of the corridor, and also to remove a deviation in the northern boundary of the offshore cable corridor. This is illustrated in ***Figure 4.4***.

85. Final refinements to the northern route were made in May 2019 to account for the change in northern extent of the East Anglia TWO windfarm site. The tie-in section to the East Anglia TWO windfarm site was amended and now routed south through the former northern portion of the East Anglia TWO windfarm site to connect to the revised boundary (see ***Figure 4.3***).

4.7.6.2.2 Refinements to the Approach to Landfall

86. As outlined in ***section 4.7.6.1.3***, EDF Energy raised concerns in relation to potential impacts to the Coralline Crag geological formation. The Coralline Crag is an exposed area of rock which underpins coastal processes along this section of the coastline which are critical to the coastal processes associated with the water cooling processes and sea defences for Sizewell B. The AoS presented in the Scoping Report (SPR 2017) allowed flexibility for refinement of cable routeing once further information on the Coralline Crag was available.

87. A desk based study (see ***Appendix 4.6***), using information provided by EDF Energy, was undertaken to investigate construction methodologies which would avoid physical impacts to the Coralline Crag. This study is summarised in ***section 4.8.2*** and the results were used to inform landfall and nearshore engineering decisions which required refinement of the offshore cable corridor in the nearshore area.

88. The results of the desk-based assessment identified that the preferred routeing option would be to the south of the exposed Coralline Crag as this allowed for co-location of the offshore export cables for both the proposed East Anglia TWO and East Anglia ONE North projects and allows the greatest flexibility for routeing. In order to route to the south of the Coralline Crag it was identified that offshore export cables would need to be routed to the south of the Concerto Seg-S cable which comes onshore to the north of Thorpeness through the southern extent of the Coralline Crag. The offshore export cables would then need to cross the Concerto Seg-S and Concerto Seg-N cables. An engineering feasibility study

identified that there was insufficient offshore cable corridor width in the approach to landfall at the south of the Coralline Crag to allow for export cable installation, routeing and cable crossing, therefore an updated AfL was submitted to The Crown Estate which included an extension to the south of the offshore cable corridor. This extension is shown in ***Figure 4.4*** and ***Figure 4.5***.

89. As part of this process, it was also identified that the northern boundary of the offshore cable corridor at the approach to landfall could be reduced as cable installation in this area was not being progressed and would not be required for anchoring of vessels. The reduction in the northern boundary of the offshore export cable route provides a larger buffer between the offshore cable corridor and Sizewell B and planned Sizewell C New Nuclear Power Station infrastructure, as well as Galloper and Greater Gabbard Offshore Windfarm export cables. Updates to the offshore cable corridor near the landfall are shown in ***Figure 4.5***

4.8 Landfall and Nearshore Site Selection and Alternatives

4.8.1 Constraints Mapping and Engineering Feasibility

90. A constraints mapping and engineering feasibility study was conducted to identify the most appropriate location for the East Anglia TWO and East Anglia ONE North offshore export cables to make landfall.

91. Mapping of constraints at or near the shoreline identified potential landfall locations based on the following key parameters:

- Avoiding areas with European, national and local ecological designations;
- Avoiding landscape and cultural heritage designations; and
- Avoiding areas with substantial infrastructure or land use e.g. nuclear energy land and infrastructure associated with its operation, housing and coastal defences.

92. Possible landfall locations identified were between Sizewell A (Sizewell Beach) and Thorpeness.

93. An engineering feasibility study was commissioned to review the landfall options in terms of construction and cost. This included a review of beach and sea bed geology, tides and currents, fishing and anchorage interactions, potential access for cable vessels and cable protection requirements. In order to assess the movement and stability of the shoreline and shallow subtidal areas, and the effects of coastal management plans over the next 50 years, a coastal stability study was also commissioned (see ***section 2.12*** of ***Appendix 4.6 Coastal Processes and Landfall Site Selection***).

94. The study showed that the main uncertainty associated with the coastline in the area is in terms of long term change in coastal processes, alongside change in sea levels related to climate change. It was considered that the available information allowed a good assessment of the area in terms of present day trends of erosion, but that some caution has to be taken in extrapolating these trends into the future. The study was also able to quantify appropriate set back distances from the cliff line depending on where a future landfall location is chosen. This was proposed on a conservative precautionary approach. The Applicant has committed to setting back the landfall transition bays to the potential 100-year erosion prediction line.

4.8.2 Identification of Offshore Cable Corridor Landfall Routeing Options

95. To determine a suitable offshore cable corridor and landfall location, the following key considerations were included:

- Environmental and policy constraints;
- Avoidance of physical impacts (as far as possible) to the Coralline Crag formation (see ***section 2.5*** of ***Appendix 4.6***) in order to avoid impacts to the hydrodynamic processes underpinning EDF Energy's cooling infrastructure, sea defences and the nearshore sandbank systems;
- Maximise distance (as far as possible) between offshore cable installation and EDF Energy's intake structures to minimise risk of suspended sediment impacting on cooling water (see ***section 3*** of ***Appendix 4.6***);
- Avoid surface laid offshore cable protection or offshore cable crossings in shallow waters (<20m) as far as possible (see ***section 4*** of ***Appendix 4.6***)., with consideration of HDD to avoid interaction with the cliffs, shallow waters and the intertidal zone; and
- Minimise interactions with existing assets.

96. In addition to the consideration above, cable routeing options took into account engineering constraints such as:

- Potential locations of suitable onshore HDD compounds;
- Achievable HDD length;
- The availability of sufficient space for offshore export cables to maintain a suitable separation; and
- The availability of sufficient space for offshore cable installation (including anchor spread of installation vessels) whilst maintaining an appropriate safety buffer with existing sub-sea cables.

97. Following the receipt of detailed information on the extent of the Coralline Crag from EDF Energy (***Figure 4.5***), an exercise was undertaken to identify potentially viable cable routeing options (see ***section 5*** of ***Appendix 4.6***). The key purpose was to identify routes where physical impacts to the Coralline Crag could be avoided or minimised, therefore the exercise looked at the potential to route around or underneath the Coralline Crag. In parallel an exercise was undertaken looking at onshore constraints to ensure that any landfall location was viable from both an offshore and onshore perspective. This work is summarised here.

98. The exercise looked at the landfall as a whole, and determined that in terms of physical processes, the offshore cable corridor at the nearshore can be split into three distinct zones:

- The area of the offshore cable corridor north of the Coralline Crag outcrop – this is characterised by the central and southern sections of the Sizewell Bank and is where the export cables of the Greater Gabbard and Galloper Offshore Wind Farms are located, making landfall just south of Sizewell B;
- The central area of the offshore cable corridor – this is dominated by the outcrop of Coralline Crag; and
- The area of the offshore cable corridor south of the Coralline Crag outcrop – this is characterised by the sediment of the ness at Thorpeness.

99. Initially, the routeing exercise identified eight potential routes within the three zones for consideration. It was determined that routes to the south of the Coralline Crag option was the most viable option. Full details of the routeing selection process are provided below***.***

100. Routeing the offshore export cables to the south of the Coralline Crag was deemed the most viable option as the sea bed in this area is relatively unconstrained, and there is the flexibility to achieve avoidance of the Coralline Crag using shorter HDD lengths which increases their technical feasibility. Whilst this option would require interaction with the Concerto Seg-S telecommunication cable relatively close to shore, it would allow for crossing of Galloper Offshore Wind Farm and Greater Gabbard Offshore Wind Farm cables further offshore (and in deeper water) than the northern options. There would also be more available space to minimise interactions with other cables. This option is also furthest from Sizewell power stations intakes and will not result in effects due to suspended sediment. The sea bed in this area is also anticipated to be more suitable for burial.

101. Whilst there were onshore constraints associated with the HDD location for the southern options, feasible options have been identified that would allow for HDD to reach the sea bed area to the south of the Coralline Crag and avoid impacts.

102. The preferred solution for installing the offshore export cable is to HDD from the onshore landfall location to the south of the Coralline Crag, this may also include HDD under a small section of the southern extent of the Coralline Crag. The HDD exit location would be in an area to the south of the Coralline Crag where it is anticipated sea bed sediment would be suitable for cable burial. Further geophysical survey and engineering investigations will be developed to consider the above matters, leading to a final cable installation location and construction method.

103. In this location, the potential for suspended sediment to effect Sizewell intake structures is significantly reduced as the proximity to Sizewell is increased to approximately 3.5km. The EIA considers the potential effects of cable installation on Sizewell infrastructure within ***Chapter 7 Marine Geology, Oceanography and Physical Processes***.

104. It was concluded that the option of routeing to the south of the Coralline Crag presented the preferred environmental, policy and engineering option and was compatible with commercially viable onshore landfall locations identified through a separate landfall selection process (see ***Appendix 4.6 Coastal Process and Landfall Site Selection***). The offshore cable corridor was refined (as outlined in ***section 4.7.6.2.2***) to include sufficient width to permit offshore export cable installation along this route (***Figure 4.4*** and ***Figure 4.5***).

4.8.3 Onshore Landfall Refined Area of Search

105. The Landfall Refined Area of Search (as shown on ***Figure 4.6*** – a version of the indicative onshore development area provided for public consultation in June / July 2018 that has subsequently been superseded by the onshore development area as shown on ***Figure 6.2)*** is a short section of the Suffolk coastline north of Thorpeness. The site was deemed to be the preferred location for the following reasons:

- The landfall can accommodate onshore cable requirements for both the proposed East Anglia TWO and East Anglia ONE North projects to connect to the grid in the vicinity of Sizewell and Leiston;
- Direct impacts on the SSSI designated at Sizewell Cliffs (Leiston - Aldeburgh SSSI) will be avoided through the use of HDD;
- There is potential to avoid impacts on the Coralline Crag rock formation offshore from the coastline through the use of HDD, and thereby significantly reduce or remove the potential impact on coastal processes in the area (and

avoid any impacts on the safe operation of Sizewell B nuclear power station's cooling water intake and outfalls);

- There is sufficient space in the identified area to accommodate set back from the cliff line to reduce risk associated with coastal erosion over the 100-year modelled scenario; and
- Avoid direct interaction with the beach through the use of HDD.

4.9 Onshore Site Selection and Alternatives

4.9.1 Onshore Substation(s) Location

4.9.1.1 Site Selection Process – Definition of Terms

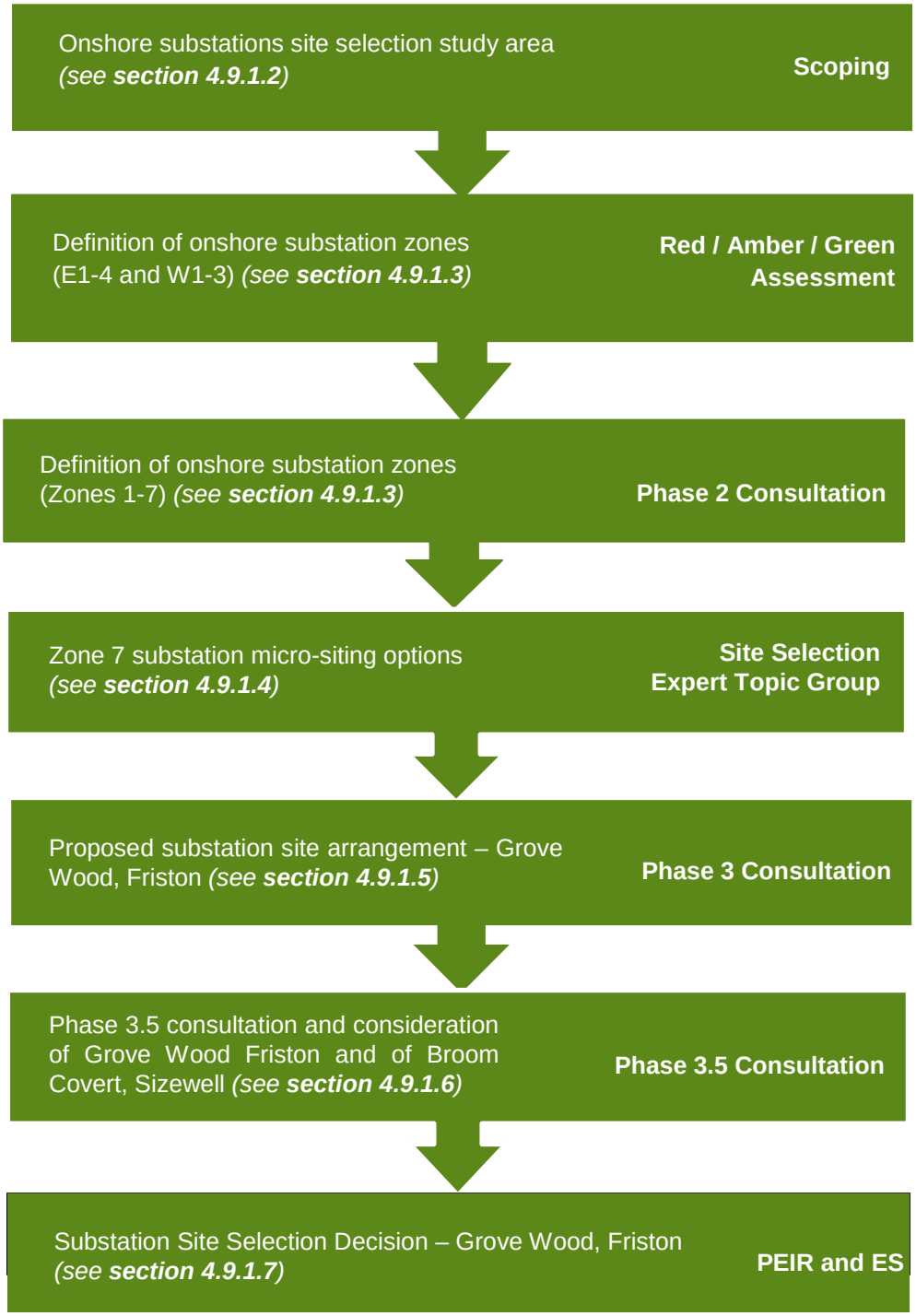
106. The areas of search for the onshore substation site selection process have followed a chronological progression of increasing refinement. Different terms are used to describe each stage of refinement. ***Plate 4.2*** illustrates the terminology used at each stage of site selection study area refinement and the strategic site selection process followed.

107. The onshore substation zones named in the Onshore Substation Site Selection RAG Assessment (***Appendix 4.2***) were re-named at the phase 2 PID consultation event. The re-naming of the substation zones was as per the following:

- Zone 1 (previously Zone E3)
- Zone 2 (previously Zone E4)
- Zone 3 (previously Zone E2)
- Zone 4 (previously Zone E1)
- Zone 5 (previously Zone W3)
- Zone 6 (previously Zone W2)
- Zone 7 (previously Zone W1)

108. The Broom Covert, Sizewell site is referred to as Zone 8.

Plate 4.2 Onshore Site Selection Refinement Process (and terminology used at each stage) for the Proposed East Anglia TWO Project (and East Anglia ONE North) by Work Phase or Consultation Phase



4.9.1.2 Onshore Substations Site Selection Study Area

109. The location of the proposed East Anglia TWO substation (the onshore substation) and the National Grid substation and associated infrastructure (for the purpose of this Chapter, referred to as 'Onshore Substations') is driven by the agreement with National Grid for a grid connection in the vicinity of Sizewell and Leiston, Suffolk. Further work was required to determine the suitability of identified land parcels for siting of substation infrastructure.

4.9.1.2.1 Site Selection Principles

110. Following the grid connection agreement, economic and efficiency principles were used to begin to define the onshore substation(s) site selection study area. The requirement for an economic and efficient solution is defined in the NPS EN-1, the National Grid's Guidelines on Substation Siting and Design (The Horlock Rules) [3] (National Grid undated) and the Electricity Act 1989 ('EA89', HM Government 1989). Review of these guidance and legislations documents resulted in the following aims:

- Onshore substation(s) to be positioned as close to the existing National Grid overhead lines as possible to reduce the requirement for cabling; and
- Onshore substation and National Grid substation to be positioned as close as possible to each other to deliver an efficient and economic system (co-location).

111. In order to identify the most appropriate location to site the onshore substations, the Horlock Rules have been taken into consideration. These guidelines document National Grid's best practice for the consideration of relevant constraints associated with the siting of the onshore substations and were taken into account as outlined within ***Table 4.4***:

Table 4.4 Application of Horlock Rules to Onshore Substation(s)

National Grid's Approach to Design and Siting of Substations (Overall System Options and Site Selection)	Substations
In the development of system options including new substations, consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects, in order to keep adverse effects to a reasonably practicable minimum	Environmental constraints and opportunities have been considered throughout the development phase of the proposed East Anglia TWO project and reported within the ES using the siting and cable routeing principles discussed and agreed with the Site Selection ETG (see ***section 4.9.1.2.1*** for those site selection principles)

[3] National Grids rules designed to assist those responsible for siting and designing substations to mitigate the environmental effects of such developments

National Grid's Approach to Design and Siting of Substations (Overall System Options and Site Selection)	Substations
Amenity, Cultural or Scientific Value of Sites	
The siting of new National Grid Company substations, sealing end compounds and line entries should as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections.	Internationally and nationally designated sites have been avoided and the onshore substations are not located within a: - National Park; - AONB; - Heritage Coast; - World Heritage Site; - Ramsar Site; - SSSI; - National Nature Reserve; - SPA; and/or - SAC. Consideration has also been given to historic sites with statutory protection. See ***Chapter 24 Archaeology and Cultural Heritage*** for further details.
Local Context, Land Use and Site Planning	
Areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable.	Areas of local amenity value in the location of the onshore substations have been protected as far as reasonably practicable as part of the site selection process. See *Chapter 30 Tourism, Recreation and Socio-Economics* for further details. Consideration has been given to existing habitats and landscape features including ancient woodland (e.g. Grove Wood), historic hedgerows, surface and ground water sources and nature conservation areas (e.g. County Wildlife Sites). See ***Chapter 22 Onshore Ecology*** for further details.
The siting of substations, extensions and associated proposals should take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum.	The onshore substations benefit from relatively substantial existing hedgerows and woodland blocks within the local area (e.g. Grove Wood and Laurel Covert). These provide a level of mitigation of landscape and visual effects from the outset and can be strengthened with planting proposals during the construction phases of the proposed East Anglia TWO project to ensure robust screening. See ***Chapter 29 Landscape and Visual Impact Assessment*** for further details. In addition, the proposed East Anglia TWO project has made a further commitment to

National Grid's Approach to Design and Siting of Substations (Overall System Options and Site Selection)	Substations
	incorporate effective, appropriate and suitable landscape screening and planting (as part of the ongoing onshore substation design refinement) in order to reduce landscape and visual impacts, as well as any indirect impacts upon the setting of heritage assets (an Outline Landscape and Ecological Management Plan (OLEMS) has been prepared and submitted with the DCO application – document reference 8.7).
The proposals should keep the visual, noise and other environmental effects to a reasonably practicable minimum.	Visual, noise and other environmental effects have been minimised as far as possible through the site selection. See ***Chapter 29 Landscape and Visual Impact Assessment*** and ***Chapter 25 Noise and Vibration*** for further details. Noise reduction technology and design approach is discussed in ***Chapter 25 Noise and Vibration***. Suitable mitigation measures will be incorporated in the detailed onshore substation design to ensure that noise emissions will not exceed the permitted noise levels to be agreed in principle with the Environmental Health Officer at East Suffolk Council.
Design	
In the design of new substations or line entries, early consideration should be given to the options available for terminal towers, equipment, buildings and ancillary development appropriate to individual locations, seeking to keep effects to a reasonably practicable minimum.	Landscape and visual impact will be minimised by avoiding the use of tall structures and buildings wherever possible. The onshore substations will be subject to a Rochdale Envelope through pre-consent outline engineering design.
Space should be used effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation.	The permanent footprint for the onshore substations is based on maximum preliminary layouts. More space-efficient solutions may be developed if practicable during the detailed design process.
The design of access roads, perimeter fencing, earth shaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings	The design of access roads, perimeter fencing, earth shaping, planting and ancillary development will be subject to final detailed design, however these will be designed in accordance with principles of the Design and Access Statement (DAS) (submitted with the DCO application – document reference 8.7) to minimise impacts on surroundings.
Line Entry	
In open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other	Modifications to the existing overhead line structures adjacent to the National Grid substation would be required. The net new number of pylons required to accommodate the

National Grid's Approach to Design and Siting of Substations (Overall System Options and Site Selection)	Substations
overhead lines so as to avoid a confusing appearance. The inter-relationship between towers and substation structures and background and foreground features should be studied to reduce the prominence of structures from main viewpoints. Where practicable the exposure of terminal towers on prominent ridges should be minimised by siting towers against a background of trees rather than open skylines.	works is one, and will be in close proximity to the existing pylon (to the north of the National Grid substation). The design approach taken would be confirmed at detailed design phase, post consent but would be in keeping with the existing substation design as presented in ***Chapter 6 Project Description***.

112. Within the aims outlined in ***Table 4.4***, NPS EN-1 and EA89, a number of objectives were identified that set a framework of site selection principles which the site selection process seeks to adhere to:

- Avoid residential titles (including whole garden) where possible;
- Avoid direct significant impacts to internationally and nationally designated areas (e.g. SACs, SPAs, and SSSIs etc.);
- Minimise significant impacts to the special qualities (LDA 2016) of the Suffolk Coast and Heaths AONB (***Appendix 4.3*** and discussed in ***Chapter 3 Policy and Legislative Context*** *and* ***Chapter 29 Landscape and Visual Impact***);
- Minimise disruption to landowners, services, road users and residents generally, prioritising voluntary (rather than compulsory powers of) acquisition and minimising disruption during construction;
- Minimise interaction with mature woodland;
- Avoid physical interaction with land and assets owned by EDF Energy to reduce consenting and land transaction risks associated with interfering with a statutory undertaker and nuclear operator's rights;
- The onshore cable corridor / route (and therefore consideration of onshore substation(s) and landfall siting) should be kept as straight and as short as practicable;
- Minimise the number and length of HDDs (see ***Chapter 6 Project Description*** for further details);
- Minimise the number of crossings of assets (e.g. utilities) (assessed on a case-by-case basis); and
- All other policy and environmental constraints were considered on a case-by-case basis (with consideration of appropriate mitigation).

4.9.1.2.2 Initial Consultation with EDF Energy

113. The Applicant commenced communications with EDF Energy in May 2017 while in consultation with the Local Planning Authorities regarding the definition of the onshore substation(s) site selection study area and in parallel with National Grid's CION process. Consultation with EDF Energy included discussions on the availability of land within the EDF Energy estate for inclusion within the Onshore Site Selection Study Area for siting of substations, as shown in ***Table 4.5***.

Table 4.5 Initial Engagement with EDF Energy Regarding Definition of the Onshore Substation(s) Site Selection Study Area

Date	Attendees	Topics Covered
11th May 2017	SPR / EDF	Introductory meeting focussing on onshore matters
19th July 2017	SPR / NGET / EDF	Sizewell B and Leiston A sites Sizewell C New Nuclear Power Station Substation footprint
19th October 2017	SPR / EDF	Offshore coastal processes and geology
14th November 2017	SPR / EDF	Offshore technical group meeting
8th February 2018	SPR / EDF	Offshore technical group meeting Landfall Onshore surveys and data sharing

114. EDF Energy provided clarifications at the initial definition of the onshore substation(s) site selection study area, that any land associated with the Sizewell C New Nuclear Power Station development was not available for voluntary acquisition. A large proportion of this land has been allocated to provide ecological compensation and mitigation for reptiles associated with potential ecological impacts associated with the Sizewell C New Nuclear Power Station development. Discussion with EDF Energy confirmed that work in these areas is already underway. EDF Energy were therefore unwilling to voluntarily grant rights which would allow the Applicant to select any EDF Energy land for onshore substation(s) and grid connection infrastructure given the importance of this area to the future development of the Sizewell C New Nuclear Power Station. Therefore, it was concluded that there was no reasonable prospect of the necessary certificate or compulsory acquisition powers over this land being obtained.

115. The Applicant would therefore be required to rely upon seeking and exercising powers of compulsory acquisition over EDF Energy land for onshore substation(s) siting through the DCO process. EDF Energy (specifically EDF

Energy Nuclear Generation Limited, operator of Sizewell B Nuclear Power Station), owns the land and holds a Generation Licence and as such is a statutory undertaker. EDF Energy Nuclear Generation Limited also holds a Nuclear Site Licence for Sizewell B Nuclear Power Station. Section 127(2) of the Planning Act 2008 places restrictions on the compulsory acquisition of land held by statutory undertakers for the purpose of their undertaking. Such compulsory acquisition will require a certificate from the Secretary of State confirming that there will be no serious detriment to the carrying out of the undertaking, with or without land being replaced. EDF Energy has advised the Applicant that it is unable to accept the imposition of compulsory acquisition powers over its land given their need to protect the safety and security of Sizewell B Nuclear Power Station. As such, significant objections were likely to be raised by EDF Energy to the Applicant's DCO application which would require the necessary compulsory acquisition of EDF Energy land.

116. Given EDF Energy's position, the Applicant considered that it would be unable to obtain voluntarily granted rights over the EDF Energy land, and the availability of compulsorily acquisition carried a significant risk due to the complication of their statutory undertaker status. Since EDF Energy land is required for the development of Sizewell C New Nuclear Power Station, and would not therefore be available within any reasonable timescale, it was excluded from the onshore substation(s) site selection study area.

4.9.1.2.3 Use of Magnox (Sizewell A) Land

117. The Local Planning Authorities requested that the Applicant include the Magnox (former Sizewell A) land for consideration of siting of the onshore substations within the definition of the onshore substations site selection study area.

118. Sizewell A land is owned by the Nuclear Decommissioning Authority and leased to Magnox Limited, who is tasked with the decommissioning of the Sizewell A site. The property rights are therefore complex and no party alone would be able to grant the necessary rights if a substation site would be located on this land.

119. The Sizewell A Site Summary – Lifetime Plan (2006) outlines that Sizewell A decommissioning work will not be complete until 2125 (with Care & Maintenance due to commence by 2025). This area will not therefore be available when the proposed East Anglia TWO project would need to commence construction. The construction of the onshore substation would have to be undertaken on land which is yet to be decommissioned and where there is the potential for construction to compromise the Sizewell A decommissioning works. The development of the onshore substation required for the proposed East Anglia TWO project could therefore not be developed on the Sizewell A land.

120. The Sizewell A (Magnox) land was therefore excluded from the onshore substation(s) site selection study area.

4.9.1.2.4 Defining the Onshore Substation(s) Site Selection Study Area

121. The initial site selection study area (which was originally defined as far east as Aldeburgh Road*)* was extended westward following a request from the Local Planning Authorities in July 2017 to look further west by potentially crossing Aldeburgh Road. This area was previously excluded due to the potential interaction with residential titles or mature woodland. The Local Planning Authorities requested the extension westward as it was suggested that siting substations east of Aldeburgh Road would potentially have adverse impacts on the landscape associated with the Suffolk Coast and Heaths AONB (see ***Appendix 4.1***).

122. It was acknowledged by the Applicant and the Local Planning Authorities that the onshore substation(s) site selection study area should be large enough to ensure that a robust variety of alternative sites were identified and considered. Whilst it was identified that crossing Aldeburgh Road could potentially act as a significant constraint, the Applicant extended the onshore substation(s) site selection study area to investigate alternative sites that would avoid potentially impacting on the landscape associated with the AONB.

123. The onshore substation(s) site selection study area was therefore extended westward to capture the general area around the tension pylon north of Grove Wood (initially identified by National Grid during early consultation as a technically feasible connection point), doubling the westward extent of the onshore substation(s) site selection study area in proximity to the overhead lines. The onshore substation(s) site selection study area was not extended further west than the general area of the pylon north of Grove Wood due to the continuation of a similar dispersion of residential properties and similar land uses to the southwest along the overhead pylon line. In addition, further extension was deemed to be unnecessary given alternative sites within the extended onshore substation(s) site selection study area were identified as available.

124. The onshore substation(s) site selection study area was expanded to a 1km buffer either side of the overhead line route into Sizewell. This was to ensure that any potential options, at a less economic and efficient distance from the overhead line, would still be captured and considered.

125. Review of this initial onshore substation(s) site selection study area (including a 1km buffer of the overhead lines up to the tension pylon north of Grove Wood) considered land use, high-level environmental constraints (such as nature conservation designations, Historic Environment Records, Environment Agency

Flood Zone 2 and 3, and Public Rights of Way (PRoW)) and existing residential areas. Land use throughout this area is broadly similar, with large scale arable fields separated by scattered properties and small settlements.

126. The buffer defined in the process above was then expanded to follow field boundaries. This exercise was a desk-based GIS analysis supported by validated shapefiles and layers providing the boundary for the onshore substation(s) site selection study area. The following areas were then excluded (in terms of possibly locating onshore substations):

- Residential properties and titles (including gardens);
- International and national nature conservation designation sites; and
- Any areas listed as Flood Zone 3.

127. Following this exercise, the onshore substation(s) site selection study area was presented to the Local Planning Authorities in September 2017. Clarifications were also made regarding the non-inclusion of EDF reptile mitigation land (associated with Sizewell C New Nuclear Power Station; later referred to as Broom Covert, Sizewell site), and Magnox land (associated with Sizewell A) within the onshore substation(s) site selection study area. This onshore substation(s) site selection study area (as shown on ***Figure 4.7)*** was presented within the Scoping Report in November 2017 (SPR 2017) and through informal pre-application consultation to Parish Councils within the boundary of the onshore substation(s) site selection study area and at the November 2017 PIDs.

4.9.1.3 Definition of Onshore Substation(s) Zones

128. Onshore Substation Zones were identified within the onshore substation(s) site selection study area to refine down into potential locations for onshore substations. To establish the Onshore Substation Zones within the onshore substation(s) site selection study area, further consultation with the Local Planning Authorities was undertaken in July 2017 via the Site Selection ETG. The ETG indicated that an appropriate buffer should be applied to residential properties as a proxy for the minimisation of potential impacts associated with noise and visual impacts; and that the Sandlings SPA should be excluded from consideration. This would enable identification of suitable land parcels / areas for infrastructure.

129. A target buffer of 250m from residential properties was applied as a guide following consultation with Suffolk Coastal and Waveney District Council at the July 2017 Site Selection ETG. The onshore substation(s) site selection study area was subdivided into zones based on available space for co-location of the onshore substation and the National Grid substation, whilst minimising interaction

with the 250m buffer on residential properties as much as is possible. It is recognised that substation locations may encroach into this buffer once a final arrangement is determined, but identifying the buffer at this stage enabled the identification of substation zones for further investigation. Seven onshore substation zones were initially identified. These onshore substation zones are shown in ***Figure 4.8.***

130. The seven zones were not delineated by the 'hard' boundary as illustrated in ***Figure 4.8***. Each zone had flexibility contained within it to enable the onshore substations to be located according to field boundaries and delineation of land parcels. Zones were drawn and illustrated to aid consultation with members of the public, as shown at PIDs (as per ***section 4.5***).

131. Site visits of those identified zones were conducted in July and August 2017. These visits were primarily to provide an understanding of the baseline landscape character and to understand the capacity for the landscape in these areas to accommodate onshore substation(s).

4.9.1.3.1 Onshore Substation(s) Site Selection RAG Assessment

132. A desk-based Red / Amber / Green (RAG) methodology was used as one of the tools to inform onshore substation site selection. This was considered appropriate to compare a number of substation zones for siting of similar infrastructure. A RAG assessment of this type enables a clear and direct comparison between each substation zone. RAG is a standard assessment tool used in the pre-EIA process to enable the comparison of sites based on common criteria and to assess the potential risks to proposed development options.

133. Development considerations captured within the RAG assessment were archaeology / heritage, ecology, landscape, hydrology and hydrogeology, engineering, community, landscape and visual, property and planning applications. Proximity to each of these development considerations was considered to influence the RAG scoring for each development consideration (e.g. proximity to a cultural heritage asset was used a proxy for the potential impact on the cultural heritage setting of that asset). The RAG assessment was undertaken by a team of specialists comprising engineers, land agents, EIA consultants, landscape, archaeology and ecological experts. The RAG system which ranks the influence of the consideration on future development, either using defined parameters, professional judgement, or assessing the issue relative to the other potential options.

134. The methodology identified development considerations equally, i.e. there was no weighting of different development considerations applied relatively to each other so as not to prioritise particular environmental parameters and to consider

all parameters as equally important. Whilst weighting was not incorporated in the RAG assessment findings, professional judgement, and feedback through the consultation process on the RAG assessment criteria, RAG scoring and appropriate buffers to environmental considerations was taken into consideration to inform the site selection.

135. The results of the RAG assessment were submitted to the Local Planning Authorities in November 2017 via the Onshore Substation Site Selection RAG Assessment report (see ***Appendix 4.2*** and ***section 4.9.1.3.5*** below for further details on this RAG Assessment). The results of the substation zones RAG assessment were further discussed and presented to these stakeholders during a site visit and workshop in December 2017. The RAG assessment does not identify the chosen onshore substation site, rather it is a tool that allows a number of sites to be compared and the most acceptable sites identified at the time to progress to further assessment stages.

136. During consultation at the December 2017 site visit and workshop, the Local Planning Authorities expressed concern that siting substations in the eastern half of the Onshore Site Selection Study Area could have a significant impact on the Suffolk Coast and Heaths AONB and recommended that crossing Aldeburgh Road be formally assessed for engineering feasibility. In addition, the Local Planning Authorities requested that the additional cost to the Applicant of the length of cable route should be discounted from the RAG assessment as this should not be a factor associated with site selection.

137. During the December 2017 site visit and workshop, the Applicant suggested that the potential to remove woodland to the west of Aldeburgh Road to facilitate the potential to cross Aldeburgh Road and access the identified substation zones to the west of Leiston could be fully investigated. The suitability of the western substation zones versus the eastern substation zones (delineated by Aldeburgh Road) could therefore be investigated.

138. Identified actions from the December 2017 workshop and site visit agreed with the Local Planning Authorities were to investigate the engineering feasibility of crossing Aldeburgh Road if woodland was removed and to assess the potential impact on the Suffolk Coast and Heaths AONB if substation(s) were to be sited in or adjacent to it.

4.9.1.3.2 Onshore Substations Suffolk Coast and Heaths AONB Impact Appraisal

139. The Suffolk Coast and Heaths AONB impact appraisal (***Appendix 4.3***) used the ‘natural beauty’ indicators (LDA Design 2016) as indicators for landscape qualities of the AONB. Each substation zone was assessed against each ‘natural beauty’ indicator assessing the magnitude of change to the special quality and

potential effect on the AONB special qualities. The appraisal concluded that if the substation(s) were to be sited in or immediately adjacent to the AONB then there were likely to be significant effects on the special qualities of the AONB, and if sited within the western substation zones, there were likely to be no significant effects on the special qualities of the AONB.

4.9.1.3.3 Policy Assessment of NPS EN-1 and NPPF Relating to Areas of Outstanding Natural Beauty

140. NPS EN-1 states that "*National Parks, the Broads and AONBs have been confirmed by the Government as having the highest status of protection in relation to landscape and scenic beauty*" and that development consent may only be granted in these areas in "*exceptional circumstances*".

141. NPS EN-1 clearly states at paragraph 5.9.9 within a section titled 'Development proposed within nationally designated landscapes', that "*National Parks, the Broads and AONBs have been confirmed by the Government as having the highest status of protection in relation to landscape and scenic beauty. Each of these designated areas has specific statutory purposes which help ensure their continued protection and which the IPC* [now the Examining Authority and Secretary of State] *should have regard to in its decisions*".

142. Paragraph 5.9.9 goes on to state that "*The conservation of the natural beauty of the landscape and countryside should be given substantial weight by the IPC* [now the Examining Authority and Secretary of State] *in deciding on applications for development consent in these areas".*

143. At Paragraph 5.9.10, the matter of 'exceptional circumstances' is then discussed. This states as follows: "*Nevertheless, the IPC* [now the Examining Authority and Secretary of State] *may grant development consent in these areas in exceptional circumstances. The development should be demonstrated to be in the public interest and consideration of such applications should include an assessment of:*

- *The need for the development, including in terms of national considerations, and the impact of consenting or not consenting it upon the local economy;*
- *The cost of, and scope for, developing elsewhere outside the designated area or meeting the need for it in some other way, taking account of the policy on alternatives set out in Section 4.4; and*
- *Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated"*

144. In a section titled 'Developments in other areas' NPS EN-1 sets out at paragraph 5.9.14 that *"Outside nationally designated areas, there are local landscapes that*

may be highly valued locally and protected by local designation. Where a local development document in England or a local development plan in Wales has policies based on landscape character assessment, these should be paid particular attention. However, local landscape designations should not be used in themselves to refuse consent, as this may unduly restrict acceptable development".

145. It goes on to recognise at paragraph 5.9.15 that *"The scale of such projects means that they will often be visible within many miles of the site of the proposed infrastructure', but confirms that notwithstanding this 'The IPC* [now the Examining Authority and Secretary of State] *should judge whether any adverse impact on the landscape would be so damaging that it is not offset by the benefits (including need) of the project."*

146. Paragraph 5.9.17 then sets out that "*The Secretary of State should consider whether the project has been designed carefully, taking account of environmental effects on the landscape and siting, operational and other relevant constraints, to minimise harm to the landscape, including by reasonable mitigation"*.

147. A subsequent section of NPS EN-1 addressing 'Visual Impact' goes on to reiterate the likelihood of such infrastructure having notable visual effects, stating at paragraph 5.9.18 that "*All proposed energy infrastructure is likely to have visual effects for many receptors around proposed sites. The Secretary of State will have to judge whether the visual effects on sensitive receptors, such as local residents, and other receptors, such as visitors to the local area, outweigh the benefits of the project*".

148. A further section concerns 'Mitigation' and states at paragraph 5.9.22 *"Within a defined site, adverse landscape and visual effects may be minimised through appropriate siting of infrastructure within that site, design including colours and materials, and landscaping schemes, depending on the size and type of the proposed project. Materials and designs of buildings should always be given careful consideration"*. This confirms that the need to minimise landscape and visual harm, referred to in paragraph 5.9.17, can be met through appropriate siting, design and mitigation planting solutions.

149. The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government 2019) states that "*planning permission should be refused for major development other than in exceptional circumstances, and where it can be demonstrated that the development is in the public interest. Consideration of such applications should include an assessment of:*

- *The need for the development, including in terms of national considerations, and the impact of permitting it, or refusing it, upon the local economy;*
- *The cost of, and scope for, developing elsewhere outside the designated area, or meeting the need for it in some way;* and
- *Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated*."

150. 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 an important and relevant matter to the examination of the DCO application.

151. Part 15 of the NPPF is titled 'Conserving and Enhancing the Natural Environment'. Its paragraph 170 sets out the manner in which planning policies and decisions should contribute to and enhance the natural environment. In relation to consideration of Landscape and Visual matters, criteria (a) and (b) of NPPF paragraph 170 are the most pertinent:

a) *protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan); and*

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland.

152. Paragraph 172 of the NPPF goes on to set out that: "*Great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to these issues*".

153. Policy states that development in the AONB should proceed only in exceptional circumstances.

4.9.1.3.4 Aldeburgh Road Crossing Engineering Feasibility

154. Following an engineering feasibility review, it was deemed feasible to cross Aldeburgh Road if woodland was removed immediately west of Aldeburgh Road, north of Fitches Lane. The precise swathe of woodland required to be removed is not yet determined, but the Applicant has committed to reducing the cable route width as much as possible at this location. Early engineering work has allowed the Applicant to commit to an onshore cable route width of 16.1m (for the

proposed East Anglia TWO project only) or 27.1m total width for both the proposed East Anglia TWO and East Anglia ONE North projects at this location (reduced from the 32m onshore cable route width for one project, 64m for both projects, in non-restricted locations by removing adjacent spoil stockpiles to outside the constrained area).

4.9.1.3.5 Updated Substation Zones RAG Assessment

155. The Suffolk Coast and Heaths AONB impact appraisal and policy appraisal of NPS EN-1 regarding AONBs and Aldeburgh Road crossing engineering feasibility results were presented to the Local Planning Authorities as well as stakeholders from Natural England, the Environment Agency, Historic England, the Suffolk Coast and Heaths AONB and the RSPB at a site visit and workshop in February 2018.

156. The Onshore Substation Site Selection RAG Assessment was updated following the AONB impact appraisal and Aldeburgh Road crossing engineering feasibility reports (creating an addendum, and subsequent second version, of the Onshore Substation Site Selection RAG Assessment). These amendments were borne of further information received from the Local Planning Authorities regarding cable routeing principles (e.g. that length of onshore cable route and associated heavy goods vehicle (HGV) movements should be removed as they are a proxy for cost considerations that should not be included as part of the RAG assessment); and further clarifications received from National Grid Electricity Transmission (NGET) regarding the potential use of cable sealing end compounds as these had previously been discounted from the site selection process.

157. For the onshore substation RAG assessment this resulted in the following amendments to the parameters:

- **CHANGE**: Proximity to mature woodland

  Requirement to alter score any of the western zones to Red score associated with cable route swathe interacting with removal of mature woodland
- **CHANGE**: number of landowners parameter only triggers an Amber score for more than one landowner
- **REMOVAL**: HGV's generated from cable routeing
- **REMOVAL**: Total length of cable routeing required from landfall
- **REMOVAL**: Properties required to CPO or removal by private treaty

158. The same updates that were applied to the onshore substation RAG assessment (associated with crossing Aldeburgh Road) were changed in relation to the application to the National Grid substation RAG assessment. These included:

- **CHANGE**: Proximity to mature woodland

  Requirement to alter score any of the western zones to Red score associated with cable route swathe interacting with removal of mature woodland
- **CHANGE**: number of landowners parameter only triggers an Amber score for more than one landowner
- **REMOVAL**: Properties required to CPO or removal by private treaty

159. The final development considerations agreed with the Site Selection ETG (as per the above) are presented in ***Appendix 4.2*** (i.e. superseded versions of the Onshore Substation Site Selection RAG Assessment, prior to changes and removals as agreed with the Site Selection ETG are not included).

160. The final version of the Onshore Substation Site Selection RAG Assessment identified three substation zones as scoring equally (see ***Appendix 4.1*** for further details on this RAG Assessment). These substation zones were located (see ***Figure 4.8*** for reference):

- East of Aldringham (Zone 4);
- West of Knodishall Church village (Zone 6); and
- Northeast of Friston (Zone 7).

161. The NPS EN-1 guidance states that "*if the IPC [*now the Examining Authority and Secretary of State] *concludes that a decision to grant consent to a hypothetical alternative proposal would not be in accordance with the policies set out in the relevant NPS, the existence of that alternative is unlikely to be important and relevant to the IPC's decision"*.

162. It was communicated to stakeholders at the February 2018 site visit and workshop that locating substations within any of the eastern substation zones would be likely to result in significant, including adverse, effects on a number of the special qualities of the AONB. The NPS EN-1 and NPPF state that consent in the AONB can only be granted in exceptional circumstances. The Applicant has identified scope for developing the proposed East Anglia TWO project outside the AONB designated area, in accordance with the policy on alternatives outlined in NPS-EN1. Given that viable and consentable alternatives exist (based on the work undertaken to date) no exceptional circumstances exist for siting of the substation(s) within any of the eastern substation zones situated within or immediately adjacent to the Suffolk Coast and Heaths AONB.

4.9.1.3.6 Onshore Substation(s) Location

163. The updated Onshore Site Selection RAG Assessment report plus the work streams associated with understanding the potential impacts on the Suffolk Coast and Heaths AONB and the Aldeburgh Road woodland crossing enabled the Applicant to enter a decision-making process with a view on the most favourable substation zone. The Applicant is required to take a balanced view toward site selection and the decision is based on a range of factors including deliverability, legal requirements, planning policy, technical engineering constraints, technical assessments (such as planning policy, landscape and visual impacts and ecology) and with the benefit of knowledge gained on SPR's previous projects. The culmination of the various work streams as described in ***section 4.9.1.3*** enabled the Applicant to decide that the substation zone northeast of Friston (Zone 7) as the selected zone to be taken forward. This decision was communicated to all statutory consultees in April 2018; and communicated to the public via PIDs in May 2018.

4.9.1.3.7 Zone 7 Substation Further Studies

164. Following confirmation of the decision to proceed with Zone 7, the Local Planning Authorities were provided with further information to support this decision:

- A high-level assessment of obtaining access for construction traffic to the Zone 7 substation zone (***Appendix 4.4***); and
- High-level Landscape and Visual Impact and mitigation comparison of Zone 7 versus substation zones in the east (***Appendix 4.5***).

165. The Traffic and Access – Substation Zone 7 Appraisal concluded that an initial review of highway geometry demonstrates that there are feasible access routes to the Zone 7 substation zone.

166. The Summary Note on Landscape and Visual Impact and Mitigation concluded that development of the substations in Zone 7 appeared from a high-level LVIA to have significant effects on fewer landscape and visual receptors overall, when compared to eastern zones.

4.9.1.4 Zone 7 Substation Micro-Siting Options

4.9.1.4.1 Substation Micro-Siting

167. Following the decision to locate the onshore substation(s) within Zone 7, a process of micro-siting was undertaken to refine the best location for the two onshore substations (one substation for the proposed East Anglia TWO project and one for the proposed East Anglia ONE North project) and the one National Grid substation within the substation zone.

168. The design assumptions made for micro-siting within Zone 7 are as described within ***Appendix 4.2***.

169. Six options for the micrositing / co-location of two onshore substations and one National Grid substation were identified and presented to stakeholders at a site selection workshop with statutory consultees held in June 2018. The exercise was driven by the development considerations mapping used throughout the Onshore Substation Site Selection RAG Assessment, survey data and desk-based data available, as outlined in ***section 4.9.1.3***.

170. The six options considered are presented in ***Figure 4.9*** to ***Figure 4.14***.

171. The primary driver for the co-location and micro-siting of the three substations (the East Anglia TWO onshore substation, the East Anglia ONE North onshore substation and the National Grid substation) is landscape and visual impact. The proximity of Friston village to the south of Substation Zone 7, and views from it toward the substation infrastructure, as well as views from surrounding isolated properties, all favour a co-location of all three substations in close proximity to one another (i.e. Option 1). This maximises the potential of the surrounding woodland areas (Grove Wood, Old World Wood and Laurel Covert) to provide a natural screening effect to nearby visual receptors (as identified in ***Appendix 4.5***) and to utilise these woodland blocks for a sympathetic planting scheme.

172. Siting of substations out with the woodland areas would bring in visual receptors from the residential settlements of Friston, Knodishall, Knodishall Hall and local rural dwellings; users of the local PRoW network; and motorists on the local road network an almost unobstructed view of the substation(s) and this option was therefore rejected.

173. The landform to the west of Grove Wood is relatively flat and gently undulating, with the landform to the north of the zone rising gradually and providing some visual containment. The high-level LVIA assessment (***Appendix 4.5***) identified notable opportunities for deliverable and effective mitigation in the form of new woodland planting by connecting to existing mature woodland blocks with further woodland planting and strengthening the existing hedgerow network.

174. It is considered that with the arrangement proposed in Option 1 (***Figure 4.9***) that landscape mitigation could be secured more effectively and is capable of being delivered and effective over the long term as part of a landscape mitigation secured under a requirement in the draft DCO. Siting of the substations out with the arrangement proposed in Option 1 (any of the other Option 2-6) would not have the same capacity to deliver an effective mitigation. This allowed the Applicant to define the Substation Refined Area of Search as shown on ***Figure 4.6***.

175. The Substation Refined Area of Search was presented to statutory consultees at the site selection workshop on 7th June 2018. Consultees were in agreement that the proposed location of the substations (with some further refinement associated with engineering refinement and appropriate buffers applied to woodland areas) would be suitable to progress for the assessment.

4.9.1.5 Proposed Substation Site Arrangement – Grove Wood, Friston

176. At the end of June 2018, a project decision was made to further microsite the onshore substations which required the partial removal of a small section of woodland on the south western corner of Laurel Covert to enable the arrangement shown in ***Figure 4.15***. The reasons for this arrangement are:

- Parallel alignment of the East Anglia TWO and East Anglia ONE North onshore substations with the National Grid substation to improve constructability and interconnection;
- Maximising the separation distance between the village of Friston and onshore substations;
- Greater land availability for onshore cable route installation for an onshore cable route that approaches the onshore substations from the south (as opposed to from the east looping around Grove Wood);
- Avoidance of onshore cable route (as it approaches from the south, rather than the east) passing beneath the existing overhead lines to reduce construction activity health and safety risks);
- Provision of additional separation between the East Anglia TWO and East Anglia ONE North onshore substations and Grove Wood, providing the opportunity for additional planting if required; and
- Provision of additional space for Construction Consolidation Sites in the immediate vicinity of the East Anglia TWO and East Anglia ONE North onshore substations.

177. The proposed arrangement will require the removal of a small section of woodland associated with Laurel Covert, however this will not remove the natural screening effect provided by the mature woodland block as woodland is intended to be removed only from the ‘internal’ edge of Laurel Covert.

178. The proposed arrangement of the East Anglia TWO onshore substation, East Anglia ONE North onshore substation and National Grid substation is presented in ***Figure 4.15***. This was included within the Proposed Onshore Development Area presented in the PEIR. Final refinement of the onshore substations and National Grid substation arrangement within the onshore development is described in ***Chapter 6 Project Description.***

4.9.1.6 Phase 3.5 Consultation and Consideration of Broom Covert, Sizewell

4.9.1.6.1 Phase 3.5 Consultation

179. An additional phase (phase 3.5) of pre-application consultation was undertaken in response to Local Planning Authority non-statutory responses from the phase 3 consultation to further consider a potential substation site on the EDF Energy estate. In parallel with this request, during consultation in August 2018 EDF Energy indicated that they may be prepared to release a parcel of land on the corner of Sizewell Gap and Lovers Lane to the Applicant for a potential substation location if suitable alternative mitigation land was identified and delivered by the Applicant for the purposes of the Sizewell C New Nuclear Power Station development, and there was no additional risk, cost or programme implications to EDF Energy in the development of the Sizewell C New Nuclear Power Station.

180. The Broom Covert, Sizewell land is located within the Suffolk Coast and Heaths AONB and is currently being used as a site to translocate protected wildlife in preparation for the Sizewell C New Nuclear Power Station development. EDF Energy has been working closely in recent years with Suffolk Wildlife Trust and Natural England to establish this agreed ecological mitigation area.

181. Phase 3.5 enabled the Applicant to engage with local communities and consultees on the opportunity to consider this alternative substation site at Broom Covert, Sizewell (Zone 8) in parallel with our proposals for a substation site at Grove Wood, Friston (Zone 7). In addition, this phase of consultation was used to communicate additional information on the Grove Wood, Friston site, particularly regarding additional information from National Grid on connection to the electrical transmission network, likely HGV transport routes on the local road network work and proposals for Sustainable Drainage System (SuDS) ponds to facilitate substation drainage works.

182. As part of the Phase 3.5 consultation, a proposed substation(s) site arrangement was prepared to enable a comparison between the two substation sites (see ***Figure 4.16***). Extensive discussions with EDF Energy on the availability and deliverability of the Broom Covert, Sizewell site were also undertaken, as outlined in ***Table 4.6***.

Table 4.6 Engagement with EDF Energy Regarding Potential Broom Covert, Sizewell Alternative Substations Location

Date	Attendees	Topics Covered
22 August 2018	SPR / EDF	Discussions on technical and commercial matters regarding the availability of Broom Covert, Sizewell and the need for replacement reptile mitigation land
31 August 2018	SPR / EDF	Discussions on commercial matters regarding the availability of Broom Covert, Sizewell

Date	Attendees	Topics Covered
7 September 2018	SPR / EDF	Discussions on commercial matters regarding the availability of Broom Covert, Sizewell
12 September 2018	SPR / EDF	Discussions on commercial matters regarding the availability of Broom Covert, Sizewell
19 September 2018	SPR / EDF	Discussions on commercial matters regarding the availability of Broom Covert, Sizewell
21 September 2018	SPR / EDF / Natural England Suffolk Wildlife Trust	Discussions on replacement reptile mitigation land
27 September 2018	SPR / EDF	Discussions on commercial matters regarding the availability of Broom Covert, Sizewell
12 October 2018	SPR / EDF	Discussions on commercial matters regarding the availability of Broom Covert, Sizewell
22 November 2018	SPR / EDF	Discussions on technical and commercial matters regarding the availability of Broom Covert, Sizewell and the need for replacement reptile mitigation land

183. As a responsible developer, the Applicant takes a balanced view towards site selection at all times using its industry leading legal advisors who draw on national planning guidance and industry leading technical advisors, in addition to its own project experience, notably in the successful development of East Anglia ONE and East Anglia THREE Offshore Wind projects.

184. The Applicant received over 600 responses to Phase 3.5 consultation from members of the public, local interest groups and statutory stakeholders. Feedback was received in relation to the Grove Wood, Friston, site and the Broom Covert, Sizewell site. This consultation for the Broom Covert site highlighted concerns regarding the likely impacts of the proposed onshore substations on the Suffolk Coast and Heaths AONB and therefore compliance with National Policy.

185. NPS EN-1 sets out the criteria to be applied to determine whether 'exceptional circumstances' can be demonstrated to justify major development within the AONB. It is the Applicant's view that a feasible alternative site for the substation has been identified outside of the AONB, at Grove Wood, Friston, therefore such exceptional circumstances do not apply.

4.9.1.6.2 Onshore Substations Site Comparison

186. In order to further assess the Grove Wood, Friston and Broom Covert, Sizewell substation sites, the Applicant undertook a consideration of land requirements;

critical path programme; key policy; design / construction; operations; and commercial viability / cost in parallel with the Phase 3.5 consultation. The Applicant's project experience and knowledge of the sites has been applied in reaching judgements on each of these criteria in order to ensure balanced, robust and transparent conclusions are reached based on the above considerations.

187. Significant differences between the two substation sites:

- Presence of Broom Covert, Sizewell within the Suffolk Coast and Heaths AONB, contrary to NPS EN-1 and NPPF policy, presenting a significant consenting risk to the project. A suitable alternative outside the Suffolk Coast and Heaths AONB exists (Grove Wood, Friston) and therefore exceptional circumstances do not exist to site within the AONB.
- The Broom Covert, Sizewell site is located within the AONB (which is contrary to the NPS EN-1 policy) and siting in the Broom Covert, Sizewell site is likely to result in significant effects on some of the special qualities of the AONB;
- Significant risk of Compulsory Acquisition Powers not being available to SPR at the Broom Covert, Sizewell site (due to the proximity to Sizewell B Nuclear Power Station and Galloper Offshore Wind Farm statutory undertaker land and the use of the site as reptile mitigation land for the proposed Sizewell C New Nuclear Power Station development
- The need to secure replacement reptile mitigation land for the Sizewell C New Nuclear Power Station development on a voluntary basis, without the ability to secure land by compulsory acquisition (as land would need to be secured prior to SPR's compulsory acquisition rights being made available to allow its use by EDF).
- Additional costs incurred in laying an additional 6km cable length to Grove Wood, Friston.

188. The Applicant's internal review was presented to the Local Planning Authorities, Friston Parish Council and Leiston Town Council at meetings in December 2018 to communicate the decision-making process and onshore substation site selection decision.

4.9.1.7 Substation Site Selection Decision

189. The Applicant has undertaken an extensive range of site selection studies in order to fully appraise the onshore substation site selection, and in particular the Grove Wood, Friston and Broom Covert, Sizewell sites including:

- Onshore Substations Site Selection RAG Assessment;
- Onshore Substations Suffolk Coast and Heaths AONB Impact Appraisal;

- Policy Assessment including NPS EN-1 Relating to Areas of Outstanding Natural Beauty; and
- Consultation Phase 3.5; and
- The Applicant's consideration of land requirements; critical path programme; key policy; design / construction; operations; and commercial viability / cost.

190. The Broom Covert, Sizewell site presents policy challenges toward gaining consent which outweigh the increased cost of further cabling to the Grove Wood, Friston site.

191. Specifically, the Broom Covert, Sizewell site is within an AONB and at a sensitive location due to the AONB being both narrow in width and having already had its landscape character influenced and adversely affected by the development of large-scale energy generation and transmission infrastructure in the immediate vicinity. Development, including screening and mitigation, at Broom Covert, Sizewell, is likely to have a significant effect on openness, tranquillity, views and character of the AONB. This erosion of the special qualities and the small scale of this part of the AONB increases its sensitivity to further effects. The Grove Wood, Friston, site lies outside the AONB and is not in a locally designated landscape.

192. It is the Applicant's position, in accordance with policies set out in NPS EN-1 and based on extensive advice and stakeholder engagement that the Grove Wood, Friston site offers the most appropriate option for the siting of the East Anglia TWO onshore substation.

4.9.2 Onshore Cable Corridor

4.9.2.1 Onshore Cable Refined Area of Search

193. The location of the onshore cable corridor is driven by the location of the onshore substation (***section 4.9.1***) and the location of the landfall (***section 4.8***).

194. The onshore cable corridor routeing followed the same framework of site selection principles as the onshore substation site selection process and therefore utilised the same area of search as the onshore substations:

- Avoid residential titles (including whole garden) where possible;
- Avoid direct significant impacts to internationally and nationally designated areas (e.g. SACs, SPAs, and SSSIs etc.) where possible;
- Minimise significant impacts to the special qualities (LDA 2016) of the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (***Appendix 4.3*** and discussed in ***Chapter 3 Policy and Legislative Context*** and ***Chapter 29 Landscape and Visual Impact Assessment***);

- Minimise disruption to landowners, services, road users and residents generally, prioritising voluntary (rather than compulsory powers of) acquisition and minimising disruption during construction;
- Minimise interaction with mature woodland;
- Avoid physical interaction with land and assets owned by EDF Energy to reduce consenting risk associated with interfering with another DCO proposal (statutory undertaker);
- The onshore cable corridor / route (and therefore consideration of substation and landfall siting) should be kept as straight and as short as practicable;
- Minimise the number and length of HDDs (see ***Chapter 6 Project Description***);
- Minimise the number of crossings of assets (e.g. utilities) (assessed on a case-by-case basis); and
- All other policy and environmental constraints have been considered on a case-by-case basis (with consideration of appropriate mitigation).

4.9.2.2 Constraints Mapping and Engineering Feasibility

195. Detailed constraints mapping within the onshore cable corridor study area was used to refine the onshore cable corridor to Grove Wood, Friston following identification of the substation site and landfall locations.

196. Key environmental constraints sourced from the public domain were mapped as part of the Onshore Substations Site Selection RAG Assessment (Appendix 4.2) and apply equally to the onshore cable corridor area of search. These included AONB, SSSIs, SACs, SPAs, Scheduled Monuments and Grade I, II and II* Listed Buildings (including Historic Environment Records). Local environmental constraints were then identified including areas of mature woodland. Potential route corridors, based on environmental constraints were identified.

197. In parallel, an engineering feasibility study considered how cables could, in practice, route around, through or under existing infrastructure.

198. An iterative and multidisciplinary approach incorporating engineering, constructability, cost, environmental, landowner, community, and stakeholder considerations was used in the development of cable corridor options. A series of internal team workshops were held to ensure each of the factors were considered effectively.

199. Various stages of site selection work which have led to the identification of the onshore cable corridor. These stages were:

- Identification and characterisation of the onshore substation(s) site selection study area;
- Refinement of the onshore cable corridors into a study area (shown at Scoping stage);
- Production of the chosen Onshore Cable Corridor Refined Area of Search;
- Review of the preferred Onshore Cable Corridor Refined Area of Search; and
- Production of the Onshore Cable Corridor Refined Area of Search option for PEIR consultation.

200. The identification of the onshore cable corridor, in consultation with Local Planning Authorities and relevant statutory consultees, allowed the onshore substation(s) site selection study area to be refined to an Onshore Cable Corridor Refined Area of Search (***Figure 4.6***). The Onshore Cable Corridor Refined Area of Search was formulated as follows:

- Designated areas within these corridors, including areas of SSSI, SPA and Ancient Woodland, were removed;
- The settlements of Thorpeness, Sizewell, Leiston, Coldfair Green, Knodishall and Friston, as well as isolated residential properties and titles were also removed;
- The narrowest section of the 'Leiston – Aldeburgh SSSI' and the 'Sandlings SPA' was identified for the potential crossing location to reduce potential impacts on these designated sites. This has resulted in a significant route north from the landfall location to avoid interaction with key international and national environmental constraints;
- The site of the 'Leiston - Aldeburgh SSSI' and the 'Sandlings SPA' crossing was widened to increase routeing flexibility in this area (the Applicant has discussed the option of HDD at this location to reduce potential direct impacts on the SSSI and SPA with statutory and non-statutory consultees);
- Routeing across the woodland (and identified removal of trees) to the west of Aldeburgh Road as this is the only identified location where the cable route can cross Aldeburgh Road (***section 4.9.1.3.4***). The Applicant has committed to reducing the cable swathe to 16.1m for the proposed East Anglia TWO project only or 27.1m for both the proposed East Anglia TWO and East Anglia ONE North projects, as well as retaining a minimum 5m buffer of woodland at this location to retain as many trees as possible at this location, reduce impacts on heritage setting on the Grade II listed building (Raidsend) and a retaining a woodland buffer to residential properties to the south of Fitches Lane;

- Opening out the potential cable route around Grove Wood so that a cable route could potential retain the option to route from the north or from the south to maximise flexibility; and
- Widening out of the Onshore Cable Corridor Refined Area of Search where possible to the edge of land boundaries to maximise potential for the landfall compound, construction consolidation sites and HDD compounds.

4.9.2.3 Proposed Onshore Cable Corridor

201. The potential onshore cable corridors associated with each substation location were assessed as part of the Onshore Substations Site Selection RAG Assessment from a technical and environmental perspective (cost having been excluded following recommendations by the Site Selection ETG through consultation).

202. In June 2018, The Applicant committed to cable routeing to the onshore substation(s) to the south of Grove Wood, thereby excluding the option to the north of Grove Wood. This decision was made for these reasons:

- Separation of construction works for the onshore substations from the existing overhead line and the overhead line realignment works required to be undertaken by National Grid to accommodate the onshore substations grid connection;
- Allowing the onshore substations to be located slightly further north east away from the village of Friston (cabling around the north and west of Grove Wood would require the substation to be located further west); and
- The onshore cable corridor would enter the southern boundary of the East Anglia TWO and East Anglia ONE North onshore substations, exit the northern side of the East Anglia TWO and East Anglia ONE North onshore substations and into the southern boundary of the National Grid substation, thereby minimising the lengths of the cable required.

203. Following consultation on the PEIR, the onshore cable corridor has been reviewed and refined and an onshore cable corridor produced for the proposed East Anglia TWO project, as detailed in ***Chapter 6 Project Description***, and the environmental assessment as set out in this ES. Further details on the key inputs to this refinement process are presented below in ***section 4.9.3.***

4.9.3 Onshore Development Area Refinement

204. Following PEIR consultation, a review of consultation feedback and additional data and information available was undertaken to refine the onshore development area, including:

- Community feedback;
- Landowner feedback;
- Ecological designations and recreational assets;
- Results from the archaeological geophysical survey;
- National Grid infrastructure design work;
- Substation drainage proposals;
- Landscaping mitigation proposals;
- Ecological mitigation proposals;
- Access requirement; and
- Project design parameters and programme refinements.

205. This information has helped to refine the project design further (for details see ***Chapter 6 Project Description***).

4.9.3.1 Landowner Consultation

206. Non-statutory pre-application consultation has been undertaken with landowners and/or their land agents since September 2017 (for details see Consultation Report (document reference 5.1). Comments and suggestions put forward by landowners have helped to refine the final project design and resulted in changes to the size and location of the onshore infrastructure. Landowner comments can be summarised broadly as follows:

- Aligning to field boundaries during construction;
- Requests to reroute the cable corridor from residential properties (in some instances);
- Requests to re-locate Construction Consolidation Sites (CCSs) from residential properties (in some instances);
- Requests to reduce the size (footprint) of CCSs; and
- Reducing the amount of land that is required for the proposed East Anglia TWO project.

207. More detail regarding the ongoing consultation with landowners is discussed in ***section 4.5***.

4.9.3.2 Onshore Ecology and Recreational Features

208. In response to comments from stakeholders through the ETG process (particularly Suffolk Wildlife Trust, Natural England, Local Planning Authorities and the Environment Agency), the project design has been refined as follows:

4.9.3.2.1 Sandlings SPA

209. The onshore development area has been refined to reduce or remove interaction with the Sandlings SPA. By committing to working outside the edge of a 200m buffer of the SPA, except where crossing the SPA, the Applicant is reducing the potential interaction of proposed East Anglia TWO project with SPA supporting habitats to minimise potential construction impacts and to minimise disturbance to sensitive ornithological receptors. This approach is directly in line with the wider project aims of minimising the environmental and ecological impacts of the project; and represents a good practice example of detailed and methodical embedded mitigation. ***Section 6.7.3.10.1*** in ***Chapter 6 Project Description*** presents further details on the options available for crossing the Leiston – Aldeburgh SSSI / Sandlings SPA.

4.9.3.2.2 County Wildlife Sites

210. The onshore development area has been refined to exclude any physical interaction with County Wildlife Sites (CWS), with two CWSs identified for potential ecological mitigation / enhancement. A strip of potential ecological mitigation / enhancement has been identified to the south Grove Wood CWS but no works will be undertaken within CWS boundaries. This commitment also relates specifically to Knodishall Common CWS.

4.9.3.2.3 Suffolk Coastal Path

211. The onshore development area includes a section of the Suffolk Coastal Path. The Applicant has committed that there will be no above ground interaction with this section of the PRoW along the edge of the cliff. This section of the onshore development area is identified for underground drilling associated with HDD and there will be no interruption to use of this recreational asset.

4.9.3.2.4 Hedgerows

212. By applying a range of special engineering techniques including using lower thermal resistivity backfill in the trench and removing the spoil to a storage area further up or down the onshore cable route (thereby negating the need to store spoil adjacent to the trenches), the typical cable route width of 32m will be reduced to 16.1m when crossing important hedgerows, where possible.

213. Where hedgerow gaps are not perpendicular to the onshore cable route crossing then the maximum size of the hedgerow gap created will be minimised as far as possible on a case-by-case basis.

4.9.3.2.5 Aldeburgh Road Woodland

214. The typical onshore cable route width of 32m will be reduced to 16.1m when passing through Aldeburgh Road woodland, where possible, by applying the

same special engineering techniques as outlined in ***section 6.7.3.3.1*** in ***Chapter 6 Project Description***.

4.9.3.3 Onshore Archaeology and Cultural Heritage

215. Onshore archaeological and cultural heritage considerations have fed into the micro-siting of onshore infrastructure. These are discussed below.

4.9.3.3.1 Avoidance, Micro-siting and Route Refinement

216. In addition to avoiding direct physical impacts on designated heritage assets from the outset (see ***Chapter 24 Onshore Archaeology and Cultural Heritage***), non-designated above ground heritage assets and potential sub-surface archaeological remains have also been avoided by means of route refinement where possible. Heritage assets recorded by the Suffolk Heritage Environment Record (HER), the results of the aerial photographic and LiDAR data assessment and the results of archaeological geophysical survey have been used in the iterative design process.

217. These data have been reviewed through a series of workshops so that features and areas indicative of more substantial sub-surface archaeological remains identified to date have been avoided, wherever possible. This process has enabled the project design to be developed in a manner which takes into account known and potential features of likely high heritage significance (e.g. possible Prehistoric ring ditches) or concentrated areas of complex archaeological features indicative of Prehistoric, Roman and medieval enclosures and settlement activity so that direct impacts can be avoided (where possible). The onshore cable corridor has also been widened at certain locations to allow additional flexibility during detailed design and construction to avoid impacting on buried archaeology identified during the geophysical surveys. This approach is directly in-line with the wider project aims of minimising the environment and historic environment impacts of the project; and represents a good practice example of detailed and methodical embedded mitigation.

218. In the event that non-designated heritage assets cannot be avoided, initial informative stages of mitigation work will be employed and undertaken post-consent, followed by additional mitigation measures, as required (see ***Chapter 24 Onshore Archaeology and Cultural Heritage***).

4.9.3.4 National Grid Infrastructure Design Work

219. The Applicant has engaged with National Grid to refine the National Grid infrastructure parameters. This includes greater certainty regarding:

- Dimensions of the National Grid substation;
- Number of new permanent pylons required;

- Area within which the one new permanent pylon will be located;
- Number of replacement pylons required;
- Area within which the replacement pylons will be located;
- Dimensions of cable sealing end compounds and cable sealing end (with circuit breaker) compound;
- Area within which the cable sealing end compounds and cable sealing end (with circuit breaker) compound will be located;
- Dimensions and indicative routeing of permanent access tracks;
- Number and dimensions of temporary pylons; and
- Area where temporary pylons for overhead line realignment works will be located.

220. Greater certainty regarding the design of the National Grid infrastructure has enabled further refinement of the onshore development area and the removal of a number of residential properties from the onshore development area, as displayed in ***Figure 6.2*** in ***Chapter 6 Project Description***. Further details regarding the National Grid infrastructure parameters can be found in ***section 6.7*** of ***Chapter 6 Project Description***.

4.9.3.5 Substation Drainage Mitigation

221. The outline design of the onshore substation drainage has inherent benefit to reducing downstream flood risk in the village of Friston. The SuDS basins are designed to contain a 1 in 200-year storm event. The English standard is to design for a 1 in 100-year (+20% for climate change) storm event, so the SuDS basins are larger than required for any potential impact associated with storm event runoff.

222. The outline design of the SuDS basin that serves the onshore substation retains the potential to reduce the outflow rate of the SuDS basins by approximately 20% which would enable the onshore substation drainage strategy to reduce the runoff rate to lower than a 1 in 1-year storm event.

223. The outline design of the SuDS basin that serves the National Grid substation retains the same capacity for the National Grid substation – reducing the runoff rate associated with the footprint to lower than a 1 in 1-year storm event (signifying a reduction in the runoff associated with a 1 in 200-year storm event, which is the amount of rainfall associated with a very intense, rare storm event, to a runoff rate associated with a 1 in 1-year storm event, which is the amount of rainfall associated with a less intense, more common storm event).

224. Current outline design has not allowed for any infiltration within the footprint of the onshore substation, the National Grid substation, or the base of the SuDS basins. Following consent, detailed design will likely allow for some percolation through the base of the substations and the SuDS basins which would help reduce the required storage volume and enable greater reductions in flood risk downstream.

4.9.3.6 Strategic Landscape Mitigation

225. The Applicant has made a further commitment to incorporate effective, appropriate and suitable landscape screening and planting (as part of the ongoing onshore substation design) in order to reduce landscape and visual impacts, as well as any indirect impacts upon the setting of heritage assets. This will also result in increased ecological benefits within the landscaping area as described in the Outline Landscape and Ecological Management Plan (OLEMS) submitted with the DCO application (document reference 8.7).

226. The Applicant has engaged with the LVIA ETG on a regular basis to discuss and agree the arrangement, layout, reinstatement of the historic landscape, PRoW permanent diversions, planting specification, planting species, growth rates of the outline Landscape Mitigation Plan (oLMP, which is contained within the OLEMS) for the East Anglia TWO project. ***Table 4.7*** provide a summary of the meetings and discussions.

Table 4.7 Summary of Engagement with Technical Working Group (LVIA ETG) Regarding Definition of the Outline Landscape Mitigation Plan

Date	Attendees	Topics Covered
24th January 2019	Historic England Suffolk County Council East Suffolk Council[4]	Cultural heritage considerations
22nd February 2019	Suffolk County Council East Suffolk Council	National Grid infrastructure update Substation drainage update Landscape design strategy PRoW strategy
3rd April 2019	Suffolk County Council East Suffolk Council	National Grid infrastructure update Landscape design strategy update PRoW strategy update Tree species and growth rates Ecological considerations

[4] Note that on 1st April 2019, East Suffolk Council was created, covering the former districts of Suffolk Coastal District Council and Waveney District Council

Date	Attendees	Topics Covered
		Offsite planting strategy
23rd May 2019	Natural England Historic England Suffolk County Council East Suffolk Council Suffolk Preservation Society	Landscape design strategy update PRoW strategy update Tree species and growth rates update Ecological considerations update
12th July 2019	Friston Parish Council	Outline Landscape and Ecological Management Plan

227. Mitigation measures associated with the onshore substation and National Grid infrastructure form part of a strategic approach to enhancing landscape character and biodiversity in the local area. ***Figure 29.11*** in ***Chapter 29 Landscape and Visual Impact Assessment*** shows how mitigation planting will contribute to the wider landscape structure of the area and help consolidate green corridors for wildlife, whilst also reinstating field boundaries associated with the historic landscape; and creating a functional PRoW network enabling access routes around the green corridors and enhanced landscaping areas.

228. Mitigation planting for the onshore substation and National Grid infrastructure is shown in ***Figure 29.11*** in ***Chapter 29 Landscape and Visual Impact Assessment***. This has been designed to help screen the onshore substation in views from Friston and the wider area. Details of the mitigation planting are presented in ***section 29.3.4*** of ***Chapter 29 Landscape and Visual Impact Assessment***, and in the OLEMS (document reference 8.7).

4.9.3.7 Additional Project Refinements

229. In addition to those project refinements outlined above, the Applicant has made further project refinements in response to consultation feedback and additional data received through the Section 42 consultation process. These project refinements include:

- Commitment to the use of Euro VI HGVs, where practicable, to reduce potential cumulative impact associated with Sizewell C construction (see ***Chapter 19 Air Quality*** for further details);
- Reduction of Saturday working hours from 7am to 7pm, reduced to 7am to 1pm (see ***Chapter 6 Project Description*** and ***Chapter 25 Noise and Vibration*** for further details);
- Removal of landfall access via the B1353 (Thorpeness Road) reducing the HGV traffic demand at the Aldeburgh Road roundabout and along Aldeburgh

Road; as well as removal of the convoy system and marshalling area on Thorpeness Road (see ***Chapter 6 Project Description*** and ***Chapter 26 Traffic and Transport*** for further details);

- Reduction in footprint of all onshore cable route CCS, and removal of a CCS immediately east of Snape Road (see ***Chapter 6 Project Description*** for further details); and
- Reduction in construction programme at the landfall from 20 months to 12 months (see ***Chapter 6 Project Description*** for further details).

4.10 Summary

230. The site selection process for the East Anglia TWO windfarm site and offshore cable corridor was an iterative one involving the consideration of technical and environmental constraints through initial zone selection undertaken by The Crown Estate, the ZAP process and further detailed site-specific studies conducted by The Applicant. This included refinements to the offshore development area as a result of consultation on the PEIR (see ***sections 4.7.3*** and ***4.7.6.2.1***). These processes involved consultation with a range of stakeholders and the collation of existing and site-specific data in order to refine broad areas of search into the boundaries for the offshore development area.

231. For the onshore infrastructure (i.e. landfall, onshore cable route, onshore substation and National Grid infrastructure location) the site selection process was also an iterative one involving the consideration of technical constraints, environmental effects and deliverability. Each part of the site selection and refinement process has been consulted on to date, and feedback from these consultations has been instrumental in determining the onshore development area.

232. With regard to the potential new access locations to the Proposed Development Area, the consultation under Section 42 (local authorities and other bodies), Section 44 (landowners and other land interests) and Section 47 (the local community) of the Planning Act 2008 as well as informal consultation by the project team has provided an opportunity for stakeholders to review these locations and provide feedback on them to the Applicant for consideration for inclusion within the ES.

233. ***Table 4.8*** gives an overview of the site selection decisions that have been discussed throughout ***section 4.7, 4.8 and 4.9***.

Table 4.8 Strategic Project Site Selection Alternatives Considered

Infrastructure element	Options considered	Decision	Main environmental benefits
Offshore cable route	n/a All routeing based on constraints	n/a	n/a
Landfall	Initial landfall search area was Sizewell Village to Thorpeness. The area was then divided into sectors with the following sites taken forward: North (Sizewell Beach) Centre (Sizewell Hall / Dower House) South (Thorpeness)	South (Thorpeness)	Avoids interaction with the offshore Coralline Crag and interaction with operation of Sizewell B Nuclear Power Station cooling water intake / outlet and sea defences, allows co-location of the proposed East Anglia TWO and East Anglia ONE North projects and reduces total amount of area directly impacted. It avoids populated areas and those at risk of coastal erosion as far as possible.
Onshore cable route	The route of the onshore cable route is largely determined by the location and configuration of the onshore substations and National Grid substation as determined at PEIR stage and carried through to the ES. Refinement of Onshore Cable Refined Area of Search based upon design principles listed in ***section 4.9.2.1*** was undertaken (i.e. minimising potential interaction with European designated site – Sandlings SPA by strategic decision to cross the designated site at the narrowest section rather than electing to take the shortest direct route through the Sandlings SPA, which would route through a longer section of the SPA). The preferred onshore Cable Refined Area of Search was an onshore cable route as shown in ***Figure 4.6***. This has subsequently been superseded by the onshore development area as shown on ***Figure 6.2***.		
Onshore substation	Zones 1 – 8	Zone 7	This option maximises the potential of the surrounding woodland areas (Grove Wood and Laurel Covert) to provide a natural screening effect from nearby visual receptors (as identified in ***Appendix 4.5***); and to utilise these woodland blocks for a sympathetic planting scheme whilst considered likely to have no significant effects on the special

Infrastructure element	Options considered	Decision	Main environmental benefits
			qualities of the Suffolk Coast and Heaths AONB.
National Grid infrastructure	The location was largely determined by the location and configuration of the onshore substations and requirement for proximity to the National Grid overhead line modifications.		
National Grid connection point	An appraisal of appropriate connection options was undertaken and from this a short list of preferred onshore connection points. A grid connection offer was made by National Grid for a connection point in the vicinity of Sizewell and Leiston and this was accepted by ScottishPower Renewables in December 2017.		
National Grid overhead realignment works	The location was largely determined by the location and configuration of the onshore substations. The options considered are limited to adjacent to the proposed National Grid substation and the National Grid overhead line modifications and the National Grid temporary works areas.		

234. This site selection and assessment of alternatives chapter explains the process that has informed the project design presented in ***Chapter 6 Project Description*** and shown in ***Figures 4.1*** to ***4.16***. The design and parameters set out in ***Chapter 6 Project Description*** and the offshore and onshore development areas shown on ***Figure 6.1*** and ***Figure 6.2*** have been taken forward for assessment within technical chapters.

4.11 References

British Nuclear Group (2006) Sizewell A Site Summary – 2006/07 Lifetime Plan. Accessed on 27/06/2018: https://magnoxsites.com/wp-content/uploads/2014/03/Sizewell-A-Lifetime-Plan.pdf

Department of Energy and Climate Change (DECC) (2011a). National Policy Statement for Energy (EN-1) DECC Publications.

Department of Energy and Climate Change (DECC) (2011b). National Policy Statement for Renewable Energy Infrastructure (EN-3) DECC Publications.

Department of Energy and Climate Change (DECC) (2011c). National Policy Statement for Electricity Networks Infrastructure (EN-5) DECC Publications.

Department for Environment, Food and Rural Affairs (DEFRA) (2014). East Inshore and East Offshore Marin Plans https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312496/east-plan.pdf Accessed 18th December 2018.

HM Government (1989) The Electricity Act 1989.

HM Government (2014). East Inshore and East Offshore Marine Plans.

LDA Design (2016) Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB) Natural Beauty and Special Qualities Indicators. V1.5. Version date; 21 November 2016.

Ministry of Housing, Communities and Local Government (2019) National Planning Policy Framework. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf Accessed 4th June 2019.

National Grid (2018) Applying for an electricity connection (issue 3) https://www.nationalgrid.com/uk/electricity/industrial-connections/applying-connection Accessed 5th July 2018.

National Grid (undated) The National Grid Company Plc Substations and the Environment: Guidelines on Siting and Design https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf

National Grid (2016) Connection and Infrastructure Options Note (CION) Process for East Anglia TWO and East Anglia ONE North projects. Revision 2.

OPEN (2018) East Anglia ONE North and East Anglia TWO Onshore Substations – Suffolk Coast and Heaths AONB Impact Appraisal

SPR (2017) East Anglia TWO Offshore Windfarm Scoping Report [Online]. Available:https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010078/EN010078-000059-EAN2%20-%20Scoping%20Report.pdf Accessed 3rd July 2018.

SPR (2018) East Anglia TWO [Online]. Available: https://www.scottishpowerrenewables.com/pages/east_anglia_two.aspx Accessed 20th December 2018.

SPR (2019) East Anglia TWO Offshore Windfarm Preliminary Environmental Information Report [Online]. Available: https://www.scottishpowerrenewables.com/pages/ea_two_phase_4_consultation.aspx Accessed 30th May 2019.

The Crown Estate (2012) Export transmission cable for offshore renewable installations. Guideline for Leasing of Export Cable Routes/Corridors. Available at: https://www.thecrownestate.co.uk/media/2093/guideline_for_leasing_of_export_cable_routes.pdf. Accessed on 02/07/2019.

The Crown Estate (2014) Round 3 Progresses to the next phase. Available at: https://www.thecrownestate.co.uk/en-gb/media-and-insights/news/2014-round-3-progresses-to-the-next-phase/ Accessed on 02/07/2019.

The Planning Inspectorate (2012) EDF written representation, submitted by Bond Pearce LLP on behalf of EDF. http://infrastructure.independant.gov.uk/wp-content/uploads/2012/02/MX-5000N_20120229_120549.pdf.

The Planning Inspectorate (2017b). Advice Note Seven: Environmental Impact Assessment, Preliminary Environmental Information, Screening and Scoping.

Woodland Trust (2017) Planning for Ancient Woodland: Planners' Manual for Ancient Woodland and Veteran Trees. Practical Guidance. Accessed on 28/06/2018: https://www.woodlandtrust.org.uk/publications/2017/09/planning-for-ancient-woodland/

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