AENC-NG-CNS-REP-0284

Norwich to Tilbury

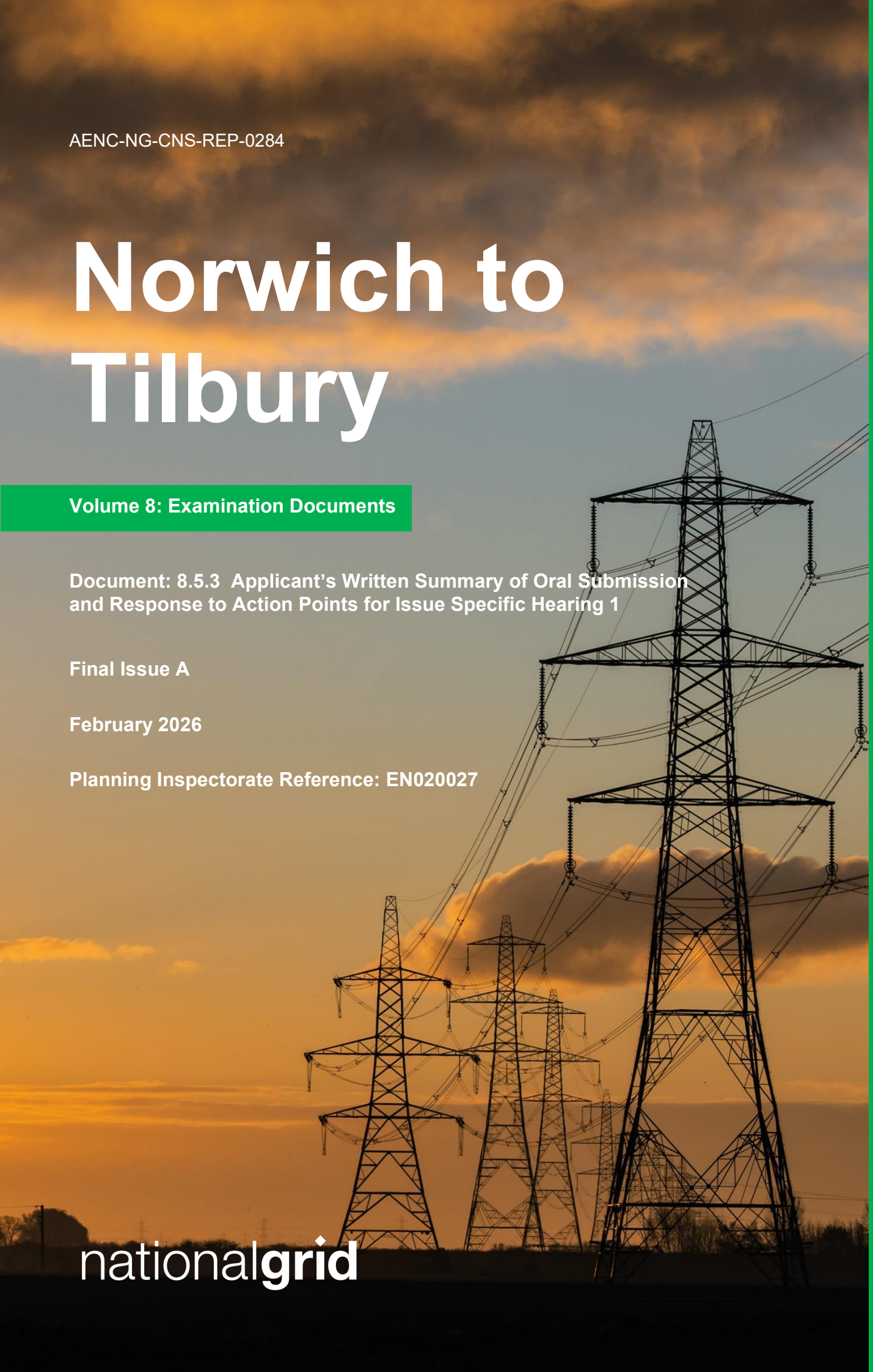
Volume 8: Examination Documents

Document: 8.5.3 Applicant's Written Summary of Oral Submission and Response to Action Points for Issue Specific Hearing 1

Final Issue A

February 2026

Planning Inspectorate Reference: EN020027



nationalgrid

Contents

1. About this Document

1.1 Introduction

1.1.1 This document summarises the case put by National Grid Electricity Transmission plc (the Applicant), at Issue Specific Hearing 1 (ISH1) on 13 February 2026 for the Norwich to Tilbury project (referred to as 'the Project').

1.1.2 The ISH1 opened at 10am and closed at 1:04pm. The agenda for the hearing was published on the Planning Inspectorate's website on 13 January 2026 [**EV2-005**].

1.1.3 In what follows, the Applicant's submissions on the points raised broadly follow the items set out in the Examining Authority's (ExA) agenda along with the Applicant's response to the ExA's Action Points from ISH1 [**EV8-005**].

1.2 Attendees on Behalf of the Applicant

1.2.1 Mr Russell Harris KC, Counsel instructed by Bryan Cave Leighton Paisner LLP (BCLP), appeared on behalf of National Grid, the Applicant.

1.2.2 The following representatives were also present:

- Ms Heather Sergent, of Counsel
- Mr Christian Drage, BCLP
- Mr Paul Reaston, National Grid
- Mr Neil Carter, National Grid
- Mr Josh Crawford, National Grid
- Mr Kevin Roeton, National Grid.

1.3 Structure of the Document

1.3.1 This document has two further chapters:

- Chapter 2: This summarises the oral case made by the Applicant at ISH1. During this, the Applicant shared a number of slides which are provided in the Slide Pack in Annex A of this document[1];
- Chapter 3: This sets out the Applicant's response to the action points published by the ExA on 11 February 2026 (Action Points from ISH1 **[EV8-005]**).

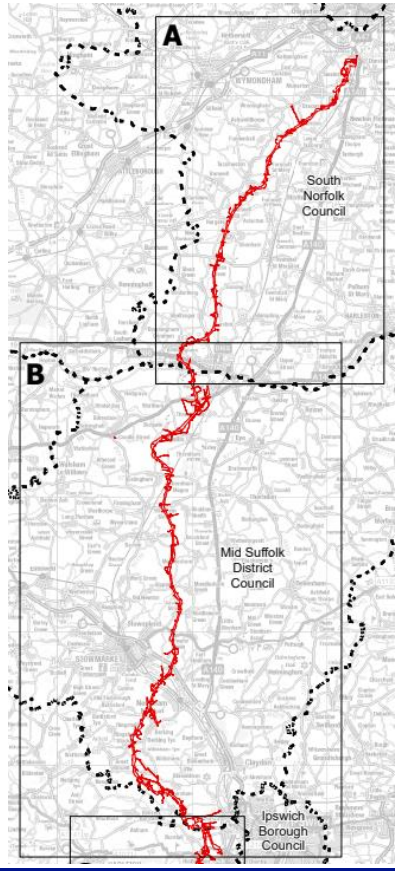
[1] To keep this document proportionate, where application documents were shared on screen during the hearing, these have had the relevant reference added to this document rather than resubmitting the documents into Examination.

2. Applicant's Oral Case ISH1

2.1 Agenda Item 4 (Scope of the Proposed Development)

Table 2.1 Item 4 (Scope of the Proposed Development)

Item No.	ExA Description	Applicant's Response
4.1a	The Applicant is to provide an overview of the location of the proposed pylon transmission route.	The Project has been developed to respond to a robust need case, multiple National Energy System Operator (NESO) proceed signals and in accordance with our duties and relevant policy, including National Policy Statements EN-1 and EN-5. The first part of the route is referred to as the RG route which would be approximately 70 km long, supported by steel lattice pylons, between the existing Norwich Main and Bramford Substations. Split into Section A and Section B, it is shown in the thumbnail extract from **2.1 Location and Master Key Plan [APP-008]** to the right. The alignment uses the route of an existing 132 kV lattice pylon connection in a number of places, as that line would be replaced as underground cable as part of the Project. The RG Route, as a whole, is viewable on **2.1 Location and Master Key Plan [APP-008]** for the alignment and on the Key Plan sheets of **2.3 Works Plans - Section A [APP-017]** and **2.3 Works Plans - Section B [APP-018]** for the Order Limits. They are also viewable on Pages 1 to 25 of **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133]**.



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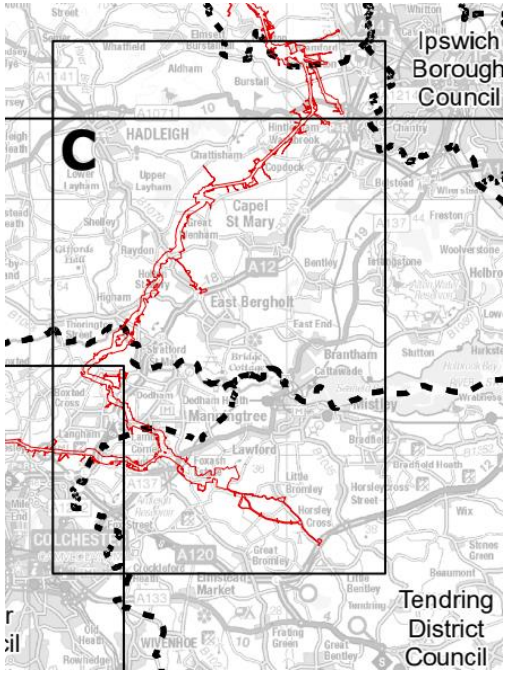
In Section A south from Norwich Main Substation, the route passes to the west of Flordon (sheets 3 and 4 of **[APP-017]**), crosses the Tas Valley (sheet 8 of **[APP-017]**) and to the west of Tibenham and Priory airfields (sheets 8 and 9 of **[APP-017]**). It continues southwards and crosses the Waveney Valley to the west side of Diss (sheets 12 and 13 of **[APP-017]** with sheet 1 of **[APP-018]**). The River Waveney forms the boundary between Sections A and B. The route passes between Mellis and Gislingham (sheets 4, 5 and 6 of **[APP-018]**) and between Stowmarket and Needham Market (sheets 12 and 13 of **[APP-018]**). The route then passes to the east of Wattisham Flying Station (sheet 15 of **[APP-018]**) before connecting at Bramford Substation **(sheet 20 of APP-018)**.



The central part of the Project is referred to as the JC route and is approximately 25 km long between the existing Bramford Substation and the new East Anglia Connection Node (EACN) Substation. The JC Route, as a whole, is viewable on **2.1 Location and Master Key Plan [APP-008]** for the alignment (from where the thumbnail extract to the right is taken) and the Key Plan sheet of **2.3 Works Plans - Section C [APP-019]** for the Order Limits. It is also viewable on Pages 25 to 34 of **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133]**.

This section includes an underground cable section through the Dedham Vale National Landscape (sheets 6 to 12 of **[APP-019]**). The JC route starts as overhead line from Bramford Substation (sheet 20 of **[APP-018]**), partly on the alignment of some existing 132 kV lattice pylons, which would be replaced by underground cable. This section passes to the south of Chattisham (sheet 4 of **[APP-019]**) and approximately 1.5 km north of Little Wenham (sheet 5 of **[APP-019]**), before it transitions to underground cable at the northern edge of Raydon airfield (sheet 6 of **[APP-019]**), continuing as underground cable past Langham and Ardleigh through to the new EACN Substation east of Ardleigh (sheet 14 of **[APP-019]**).

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		The third section is referred to as the TB route and is approximately 80 km through to Tilbury, on predominantly steel lattice pylons. The TB Route, as a whole, is viewable on **2.1 Location and Master Key Plan [APP-008]** for the alignment and the Key Plan sheets of **2.3 Works Plans - Section C [APP-019]** to **2.3 Works Plans - Section H [APP-024]** for the Order Limits. It is also viewable on pages 33 to 61 of **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133**]. It is mapped across Section C and five other sections (Sections D to H) shown in the thumbnail extracts from **2.1 Location and Master Key Plan [APP-008]** below.

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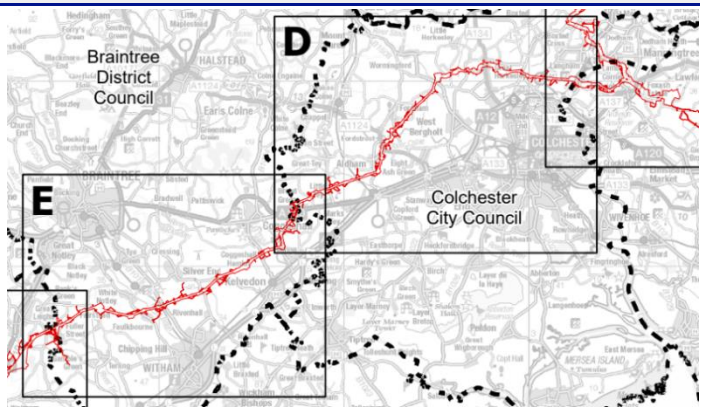
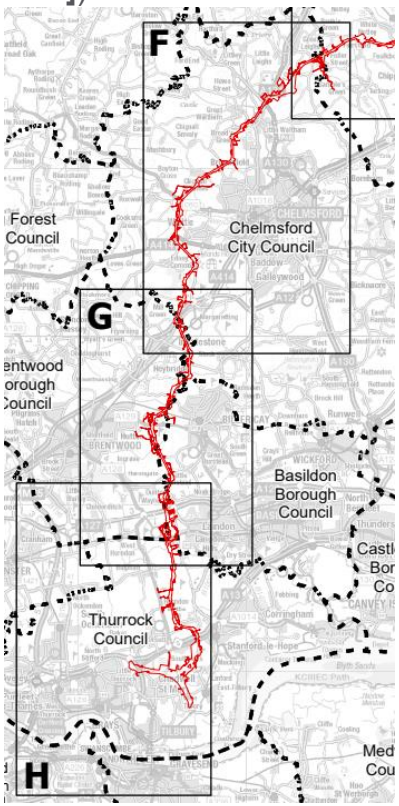
From the new EACN Substation in Section C, the TB route continues into Section D passing Ardleigh (sheets 14, 13 and 17 of **[APP-019]**) and crosses Ardleigh Reservoir and the A12 (sheets 17 and 18 of **[APP-019]**) as it continues to the north of Colchester (sheets 1 and 2 of **[APP-020]**). There is an approximately 4 km section of underground cable near Great Horkesley (sheets 2 to 4 of **[APP-020]**). The overhead line resumes and travels to the south-west crossing the Colne Valley (sheet 6 of **[APP-020]**) passing to the east of Fordham, Fordstreet and Aldham (sheets 5, 6 and 7 of **[APP-020]**) before turning to the south-west. It continues in Section E, passing between Coggeshall and Kelvedon (sheets 1 to 3 of **[APP-021]**) and south of Silver End (sheet 4 of **[APP-021]**), before it crosses an existing 400 kV overhead line (sheet 6 of **[APP-021]**) to the north of Fairstead.





The route then turns southwards into Section F passing to the north and west of Chelmsford, between Great and Little Waltham (sheets 3 and 4 of **[APP-022]**), where the first of two sections of low-height lattice pylons are included. It continues southwards as standard lattice pylons past Writtle (sheets 7 to 10 of **[APP-022]**) before moving into Section G. The route crosses the Wid Valley and then passes to the east of Ingatestone (sheet 1 of **[APP-023]**) and between Brentwood and Billericay (sheets 2 to 5 of **[APP-023]**), in part following the route of a gas pipeline through the Dunton Hills Garden Village development (sheet 6 of **[APP-023]**). Crossing into Thurrock for Section H, a second section of low-height lattice pylon is included to allow continued flying activity at Thurrock airfield

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		(sheets 1 and 2 of **[APP-024]**). The route then continues southwards, crossing Orsett golf course to the new Tilbury North Substation (sheet 4 of **[APP-024]**) from where the connection to the existing Tilbury Substation is made via reconfiguration of existing overhead lines.
4.1b	The Applicant is to provide an overview of the siting of new substations at Ardleigh and Tilbury North.	The new East Anglia Connection Node (EACN) Substation to the east of Ardleigh has been selected over a number of other locations taking into consideration the effects both from the substations, the 400 kV connections to and from it, and the infrastructure of the customers and taking account of the presence of a wide range of constraints and other environmental features. This was initially set out in the **I'm2022 - Corridor and Preliminary Routeing and Siting Study [APP-356]** with further feedback and consideration of other sites explained from paragraph 6.5.8 of **5.15 Design Development Report [APP-122]**. Making the electrical connection to the existing Tilbury Substation utilises existing overhead lines connected to a new Tilbury North Substation, which is located to the south of Orsett golf course. Connecting to Tilbury Substation itself was ruled out due to the interaction with other infrastructure and other developments. There is a detailed explanation of the options appraisal and siting of the substations in **5.15 Design Development Report [APP-122]**. Further detail was also provided later in the agenda and is included here to reduce duplication: • EACN Substation: The Applicant considered locations to the south side of the Dedham Vale, National Landscape but this was discounted because of the effects on two overhead lines. Other locations further west were also considered. The final location sits to the east of Ardleigh, with the access road from the east. This substation location finds that balance between the effects of the substation, the 400 kV connections that come to it and go away from it, and the customer connections. • Tilbury North Substation: The substation sits between the landfill to the eastern side and the Orsett golf course, south of which is the Lower Thames Crossing (LTC) development area. Scenario A has an overhead line crossing over the LTC Order Limits to the existing overhead line, whereas the now preferred scenario B crosses LTC as underground cable. In scenario B there would be two Cable Sealing End (CSE) compounds close together, tying into the existing YYJ overhead line and providing the

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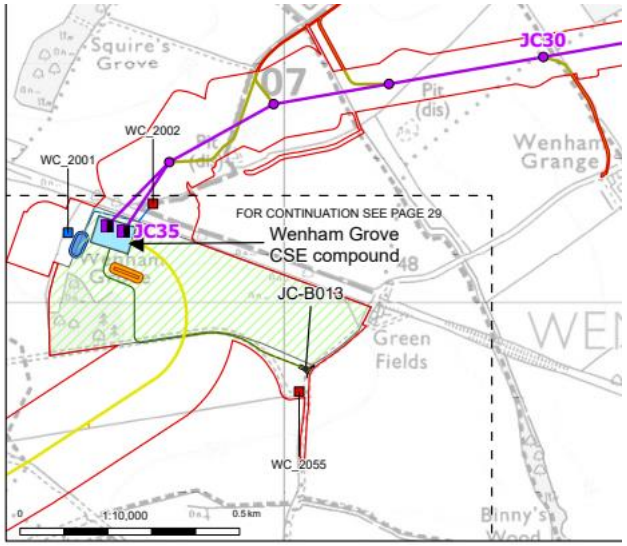
		electrical connection underneath LTC and through to the existing Tilbury Substation to the north.
4.1c	The Applicant is to provide an overview of the cable sealing ends.	There are seven Cable Sealing End (CSE) compounds, which are required at the transition point between a section of overhead line and underground cable. Therefore, the location of the CSE compounds depends on where underground cable is proposed. Whilst there are four sections of cable, there are only seven CSE compounds, because at one of the sections the termination is actually made at the East Anglia Connection Node (EACN) Substation instead. A combination of National Policy Statement EN-5 and various technical requirements was used to decide on the locations for the four underground cable sections. The CSE compounds were then carefully sited as informed by the Horlock Rules (with consideration of Holford Rules for adjacent overhead lines), to reduce effects relevant to their particular locations. • The longest section of underground cable is approximately 16 km through the Dedham Vale National Landscape. This section of underground cable starts at the CSE compound located to the north of Raydon airfield (location shown on sheet 28 and 29 of **6.4.F2 Environmental Statement Figure 4.2 - Proposed Project Design - Permanent Features [APP-134]** with a thumbnail extract from sheet 28 included to right). The cable route passes Holton St Mary, crosses the River Stour and passes Langham, where it leaves the National Landscape, but continues as underground cable past Ardleigh before reaching and terminating within the new EACN Substation. 

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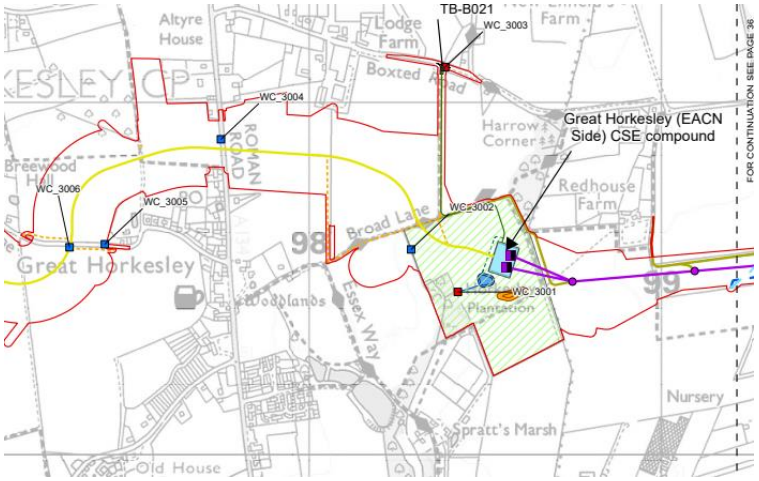
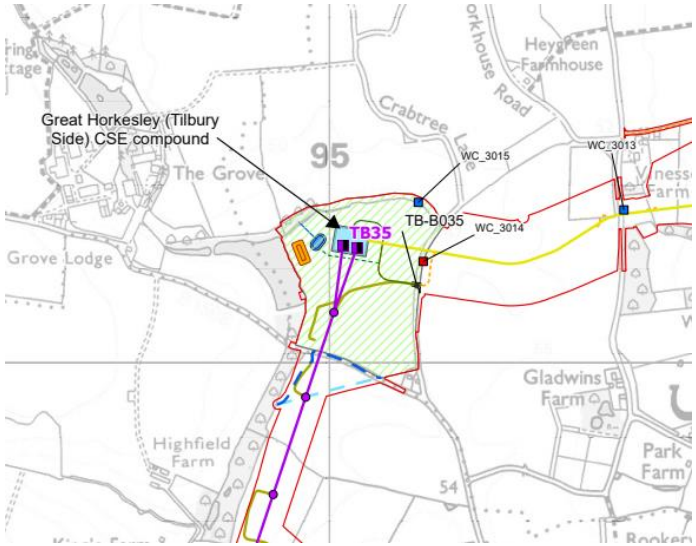
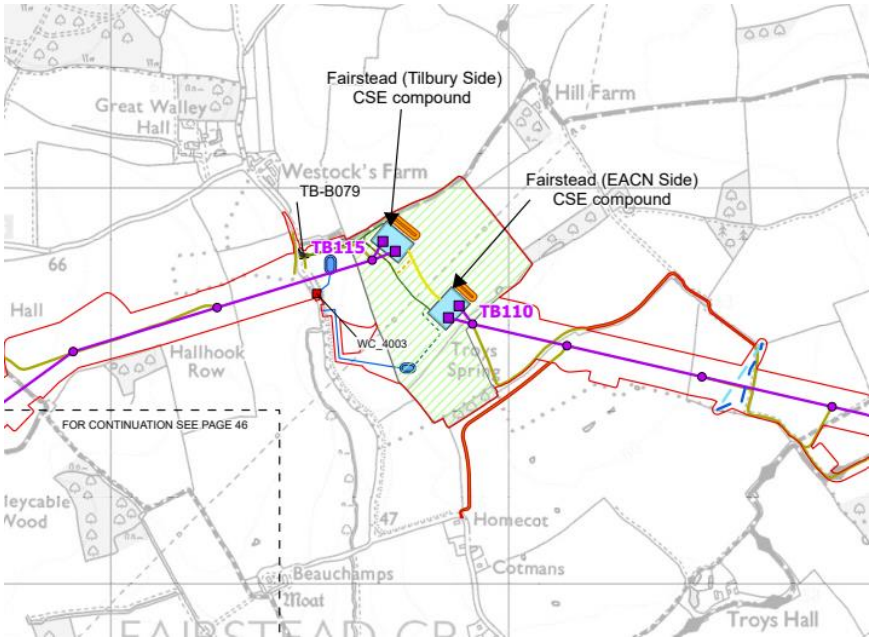
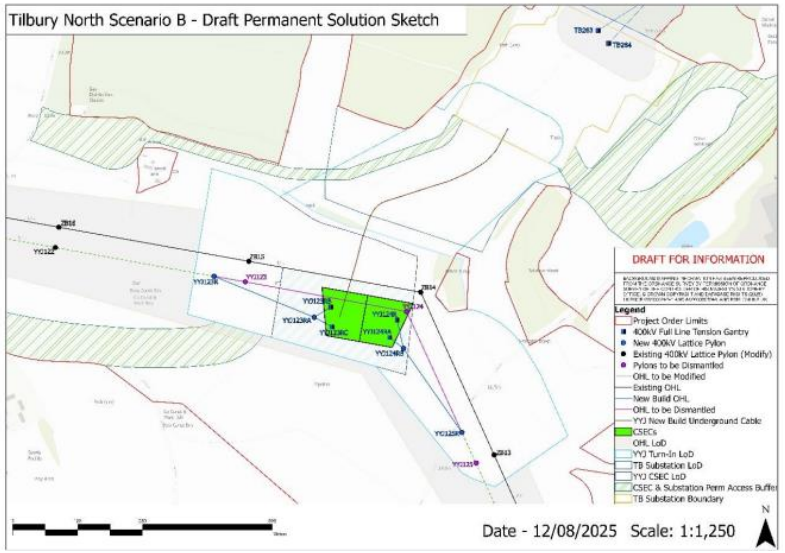
- A further section of underground cable, approximately 4 km in length, is included between two CSE compounds near Great Horkesley. This is in response to its proximity to the Dedham Vale National Landscape and the CSE compounds are sited so that effects do not compromise the special qualities, using landform and existing vegetation to provide screening. Their locations are shown on **sheet 37** (and in the image to the right) (EACN side) and **sheet 38** (and in the image below) (Tilbury side) of **6.4.F2 Environmental Statement Figure 4.2 - Proposed Project Design - Permanent Features [APP-134]**.

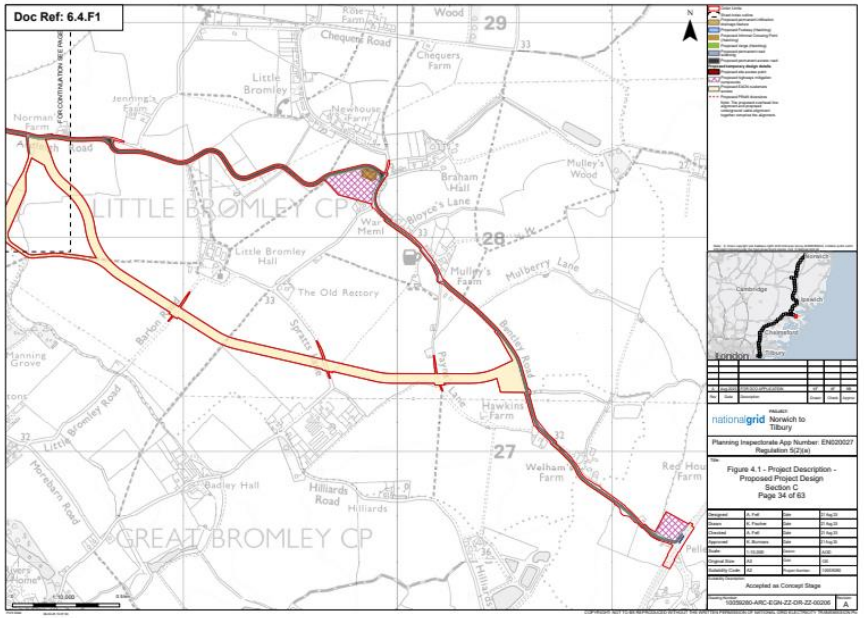




Item No.	ExA Description	Applicant's Response
		• South of Braintree, there is a short section of underground cable required for technical reasons for the route to cross an existing 400 kV overhead line. The CSE compounds have been positioned closely to either side of the existing line. This is shown on sheet 45 of **6.4.F2 Environmental Statement Figure 4.2 - Proposed Project Design - Permanent Features [APP-134]** and in the thumbnail image to the right for both EACN side and Tilbury side.



Item No.	ExA Description	Applicant's Response
		• Finally, the fourth section of underground cable connects southwards from the new Tilbury North Substation, to pass under the Lower Thames Crossing route connecting to CSE compounds constructed to terminate the cable and connect to the existing overhead line. This would be part of a modified arrangement to an existing overhead line referred to as Scenario B. Design detail is being finalised but the principle is as shown in the thumbnail image to the right from Figure 11.5 of **5.15 Design Development Report [APP-122]**. 
4.1d	The Applicant is to provide an overview of the location of the main construction compounds.	There are a number of construction compounds located at various sites. These are listed in Table 4.7 in **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]** and can be identified on **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133]**. This includes a compound at the new East Anglia Connection Node (EACN) Substation and there is another compound at the new Tilbury North Substation at the very southern part. The distribution of compounds is shown on the figure in Annex B of this document. The main construction compounds for the overhead line are indicated by the red arrows. The intermediate satellite compounds are shown as blue arrows. Additional compounds are arrowed in green (supporting substation construction) and grey (supporting cable construction) respectively for different types of satellite / temporary compound supporting the various underground sections and at each Cable Sealing End (CSE) compound and crossing location.

Item No.	ExA Description	Applicant's Response
		With many narrow roads present, the approach to construction access throughout the route uses a haul road between appropriate access points from the local road network and these would support two-way heavy goods vehicles. Construction access to the new EACN Substation is provided by a haul road shared with the windfarm customers which connects to a widened Bentley Road and onto the A120. There is also a new permanent access for abnormal indivisible loads (AILs) to the south of Little Bromley with the submission arrangements shown in the thumbnail image (reference below). This is currently the subject of one of the change requests that is being consulted on. There are also other compounds used for various supporting works for highways and for the initial road widening to facilitate that construction access and for the Distribution Network Operators' modification work. Both roads are shown on sheet 34 (the permanent access prior to amendment by the change request) of **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133]**. 
4.1e	Summary of the overview	A full account of the proposed scope of the Project can be found in **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]** and is shown on **6.4.F1 Environmental Statement Figure 4.1 – Proposed Project Design [APP-133]**.

Item No.	ExA Description	Applicant's Response
4.2	The Applicant is to provide an overview of their approach to limits of deviation (LoD).	The Applicant has applied Limits of Deviation (LoD) and the Rochdale Envelope in line with Advice Note 9[2]. This is described in paragraphs 4.6.1 to 4.6.5 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**, which details how the Rochdale Envelope and LoD have been assessed within the Environmental Statement (ES). Table 4.3 outlines the details of the LoD sought for the Project infrastructure types and therefore what is assessed within the Environmental Statement (ES) sensitive testing and flexibility in design approach: LoD are a normal feature of Nationally Significant Infrastructure Project (NSIP) developments and represent the allowed maximum deviation for permanent features such as the overhead line, pylons, Cable Sealing End compounds, underground cables and new substations. This allows for the adjustment to final positioning and height of Project features to avoid localised constraints or unknown or unforeseeable issues that may arise. **2.6.2 Design and Layout Plans - Overhead Lines [APP-042]** shows the lateral LoD for the proposed 400 kV overhead lines being 50 m either side of the centre line, 100 m in total. In practice, this means that the pylons could individually move by up to around about 30 m laterally when you also factor in the need for the swing of the conductors to remain within the LoD and the Order Limits, which means that a pylon cannot be placed at the very edge of the LoD/Order Limits. The LoD are secured by **3.1 Draft Development Consent Order [APP-056]** (draft DCO) and **2.3 Works Plans [APP-017 to APP-024]**. The draft DCO specifies that the vertical LoD would not exceed 6 m upwards for the pylons. This allows for variation in pylon positions (e.g. different topography) whilst maintaining electrical clearance requirements. The draft DCO enables longitudinal movement (up and down the centre line) restricted by technical requirements on a span-by-span basis with regards to the potential blowout of the conductor. In some locations, the LoD have been further restricted due to known constraints or extended due to specifically described scenarios. **Sheet 7 of 2.3 Works Plan - Section D [APP-020]** shows an example, at pylon TB55, where the Applicant has reduced the typical width of the LoD to avoid impact on the adjacent Aldham Hall ancient woodland.

[2] Planning Inspectorate (2025) *Nationally Significant Infrastructure Projects - Advice Note 9: Rochdale Envelope*.

Item No.	ExA Description	Applicant's Response
		There are also some site-specific prescriptive LoD commitments in **7.2 Outline Code of Construction Practice [APP-300]**, notably commitment GG34 which details 21 locations where there is prescriptive detail regards moving or not moving pylons in certain directions due to known sensitive receptors. There are also extensions to the typical LoD which apply to design scenarios which are described in Table 4.4 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**, one example being design scenario 6, the proposed Lions Hall (Lowley's) mineral site. In this location, the LoD has been extended to enable an overhead line route that reduces impact on the mineral extraction site. The Applicant responded on the process for refining the LoD both vertical and horizontal, post consent, where this would be done through the commitments register. Environmental constraints and engagement with local authorities may crystallise a particular commitment and this would be added to the commitments register in **7.2 Outline Code of Construction Practice [APP-300]**. This is answered further in response to Item 1b in Table 3.1.
4.3	The Applicant is to explain its proposals for existing pylons and overhead transmission lines, including reconfiguration, modification and removal of the existing transmission electric line and the existing distribution electric line.	<u>Reconfiguration of the existing network</u> Reconfiguration of existing 400 kV network is associated with the challenge of connecting at the existing Tilbury Substation, where, because of other infrastructure and built development, there was no acceptable route through for the 18 cables required. The alternative means of achieving the electrical connection involved modifying the existing 400 kV overhead line (referred to as the YYJ) to allow connection to be made via the existing overhead lines. The current proposal is Scenario B which still connects into the overhead line by using underground cable under the Lower Thames Crossing. The line is diverted temporarily to the south to allow Cable Sealing End (CSE) compounds to be put on it to connect the underground cable and overhead line. Figure 11.5 in **5.15 Design Development Report [APP-122]** shows both overhead line and underground cable scenarios, with the cable scenario being progressed. <u>Modification of the existing network</u> **7.18 2022 - Corridor and Preliminary Routeing and Siting Study [APP-356]** notes that the Applicant was already modifying and upgrading the existing network to maximise its

Item No.	ExA Description	Applicant's Response
		capacity before considering further reinforcement. This included various upgrading of conductors and works at substations to maximise the flows. The Applicant is also proposing modifications to the existing distribution 132 kV network. In some locations, the Applicant is proposing to replace the existing 132 kV overhead lattice line with an underground cable, which would create space for the 400 kV infrastructure and would reduce the magnitude of change. This is the case at Mellis as shown on sheets 11, 12 and 13 of **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133]** and at Haverings Grove on sheets 55 and 56 of **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133]**. In other locations, undergrounding is required to ensure electrical clearances where the 132 kV infrastructure is crossed, e.g. Dunton Hills Graden Village shown on sheet 58 of **6.4.F1 Environmental Statement Figure 4.1 - Proposed Project Design [APP-133]**. The Applicant has also assessed and would make necessary modifications to various other third-party infrastructure and wood pole-mounted telecoms and similar sorts of infrastructure, which is typically achieved by diverting them by undergrounding to maintain services whilst achieving necessary safety clearances. <u>Differences between 132 kV and 400 kV overhead lines</u> The existing 132 kV overhead line that is proposed to be removed, is on lattice pylons that are typically 25-30 m tall, which is typical for a 132 kV overhead line operated by a Distribution Network Operator. The relevant details, including the vertical LoD, are set out in a table in **2.3 Works Plans [APP-017 to APP-024]**. The transmission lines are operated by National Grid and are the high voltage lines (typically 400 kV) that transmit bulk power around the country. The distribution lines are operated by the Distribution Network Operators and distribute lower voltage power (132 kV or less) to people's homes and businesses. Higher voltage lines require larger clearance distances from the ground (or wider trench spacing when using underground cables) to avoid flashover, where electricity tries to go between different conductors. This is the reason why 400 kV pylons need to be taller than 132 kV ones, which in turn are taller than the timber pole mounted 11 kV overhead lines. The lower voltage lines have smaller cables in terms of diameter because it does not need

Item No.	ExA Description	Applicant's Response
		the same level of insulation. Some cables can also be bundled together. This means that lower voltage lines can be positioned closer together than 400 kV underground cables and therefore require a narrower LoD. Further details can be found in Table 4.3 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**. The Applicant also clarified that the shorter, wider pylons that are proposed in some locations to reduce the visual impact on specific landscape features would be secured through commitments in **7.2 Outline Code of Construction Practice [APP-300]**.
4.4a	The Applicant is to provide an overview of the choice of underground cabling (alternating current (AC) or direct DC)).	The distance of the underground cable connection is an important factor in making the decision between AC or High Voltage Direct Current (HVDC), because for the HVDC there is a need for a large converter station at the end of each 2 gigawatt (GW) connection. That means that for the 6 GW connection that is needed for Norwich to Tilbury, there would need to be three large converter stations at each connection point, i.e. it could be 12 converters in total for the capacity and connectivity of the Project being sought (assuming Norwich to East Anglia Connection Node (EACN) and EACN to Tilbury). Because of the cost of the converter stations, the balance of costs favours AC schemes where the length of cable is under approximately 50 km. The transmission benefits of HVDC only become a factor for schemes longer than this. Therefore, for the four sections of underground cable that are proposed for the Project, the longest of which is 16 km, the appropriate basis for that cable choice is the use of AC cable rather than HVDC.
4.4b	The Applicant is to provide an overview of the choice of the proposed installation methods.	A typical cross-section of an open cut underground cable installation is in **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-01 (Illustrative high voltage cable direct buried cross section and construction easement drawing), There are 18 cables needed to transmit the power, which requires six trenches with three cables in each trench. Lower voltage lines, e.g. 132 kV, typically require only one trench which is why the working width associated with lower-voltage undergrounding is much narrower than is required for a high-voltage scheme. The cable trenches for 400 kV cables require approximately a cable swathe of an indicative 50 m width, but the full construction working width needs to accommodate a typically central haul road and space for the storage of topsoil and subsoil, which equate to approximately 120 m total corridor.

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		Horizontal Directional Drilling (HDD) is a typical trenchless crossing technique used for installing cable. This is where the cables are pushed deeper to go underneath a particular feature. When the cable goes deeper, the cables need to be further apart due to the heat dispersal requirements, as shown on **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-02 (Illustrative trenchless crossing standard detail). The Order Limits are typically double the width of what is required for open cut. Trenchless techniques allow the cables to be installed without disturbance to a feature above them but requires launch and reception pits and various equipment to install them. The example shown at **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-02 (Illustrative trenchless crossing standard detail) is of HDD, but there are other techniques that are potentially available. The default technique is open-cut trenching because it is quicker to install and to reinstate the land and it is also lower cost. The Applicant has identified four locations where trenchless techniques are proposed due to responding to certain environmental and technical considerations. These locations are as follows: • Higham Road – this is to avoid disturbance to archaeological features. • River Stour – this is to avoid disturbance to a large and navigable main river watercourse. • A12 dual carriageway crossing – this is to avoid disruption to a strategic route. • Railway to the east of Ardleigh – this is to avoid closure of the railway and due to sensitivity to ground movement. The Applicant also considered trenchless techniques at other locations, for example Black Brook, just to the south of the River Stour. However, there was considered to be insufficient space between adjacent homes for the technique to be used. The selection of the installation technique at specific locations will continue to be refined through the detailed design.

2.2 Agenda Item 5 (Alternatives)

Table 2.2 Item 5 (Alternatives)

Item No.	ExA Description	Applicant's Response
5.1	The Applicant is to provide an overview of its approach to alternative methods of electricity transmission (during all pre-application stages of project design development) and reasons for discounting them, signposting to the relevant sections of Environmental Statement chapter 3, the EIA regulations, national policy requirements, and National Grid and National Electricity System Operator (NESO) guidelines.	Policy Context National Policy Statement (NPS) EN-1 identifies an urgent national need for electricity infrastructure of this nature, which is required in the national interest to be delivered as soon as possible. In terms of the consideration of alternatives as part of the examination of the substantive case, NPS EN-1 indicates, first, that the consideration of alternatives should be carried out in a proportionate manner, and, second, that only alternatives that can meet the objectives of the proposed development need to be considered. Paragraph 4.3.23 of NPS EN-1 explains that the Secretary of State will be guided by whether there is a realistic prospect of the suggested alternative delivering the same infrastructure capacity, the same energy security, the same climate change, and the same environmental benefits as the proposal in the same timescale as the proposed development. Paragraph 2.9.21 of NPS EN-5 says that overhead line should be the strong starting presumption for electricity network developments in general. That strong starting presumption is reversed, but is only reversed for nationally designated landscapes. It is not displaced where there is a high potential for widespread and significant adverse effects. In those circumstances, the Secretary of State should only prefer underground or subsea where their benefits clearly outweigh any extra economic, social or environmental impacts, applying the test set out in NPS EN-5. The Applicant has applied the strong starting presumption of overhead lines in the correct places, and it has reversed that presumption in the circumstances of the National Landscape. NESO is an independent body responsible for planning the GB energy system and for providing advice and guidance to decision-makers and applicants. It identifies the Norwich to Tilbury Project, as two of the three energy projects critical to delivering a network which supports clean power pathways. This is in the context of electricity demand, which is going to double, including in East Anglia, by 2050. NESO also identifies that support is necessary for our proposal, if possible, to bring the project forward to 2030 as opposed to 2031. In any event, delay would create substantial constraint costs and impacts on zero delivery.

East Anglia Context

The needs case in Section 3: Needs Case, Table 3.3, Page 31, of **7.17 Strategic Options Backcheck and Review [APP-355]** clearly states the existing system capabilities and the amount of energy that is expected to transfer across system boundaries. There are limitations as to what a circuit can carry, and these are defined by the International Electrotechnical Commission (IEC), who set ratings for 420 kV transmission, of 5,000 amperes being the highest available equipment. This equates to:

- a capacity on a single circuit of 3465 MVA (megavolt-ampere),
- a double circuit of 6,930 MVA, and
- where there are four circuits remaining crossing a boundary after a fault, 13,860 MVA.

The current post-fault capacities of:

- EC5N – 2031 post fault capability 6,652 MVA, leaves a deficit of -7,520 MW
- EC5 – 2031 post fault capability 13,552 MVA, leaves a deficit of -9,928 MW.

These are operating within about 300 MW of the maximum capability, and therefore new infrastructure is required to meet the deficits.

The Applicant has considered a number of different combinations of alternative strategic options to meet the need that are combined to provide different solutions. At the strategic option stage, the appraisal considered the environmental effects, including environmental constraints, in regard to international and nationally important receptors and also covered socioeconomic topics. The general conclusion at the strategic level was that there were effects that applied to and impinge on all options, but that none of those effects were insurmountable, so all options were considered deliverable in certain combinations.

In terms of the offshore network and managing this in a more coordinated and effective way. In paragraph 3.3.83 of NPS EN-1 it states that even with the importance of coordination, it is important to bring forward urgent electricity projects and consider them on their own merits.

Alternative Options Considered

The Applicant has considered a whole range of different alternatives on the Project, some more theoretical and conceptual, as reported in **7.17 Strategic Options Backcheck and Review [APP-355], 6.3 Environmental Statement Chapter 3 - Alternatives [APP-127]** and **5.15 Design Development Report [APP-122]**. More localised design variants have also been considered.

The Applicant considered the following options, as well as alternating current (AC) overhead lines:

Item No.	ExA Description	Applicant's Response

An AC gas insulated line - this uses a tube with an insulator in it and gas surrounding it as the insulation material. No AC gas insulated line has been constructed anywhere in the world above 10 km. It is not a technology that has reached a maturity at transmission level for this proposal.

AC underground cables – these require a Cable Sealing End (CSE) compound or substation every 20-30 km to have a set of reactors and switching stations to manage technical limitations on the way that cables work and to avoid a collapse of energy within the cable. Therefore, an AC underground cable has to come above the ground and reactors are needed.

High voltage direct current (HVDC) cable – this requires a converter station at each end of the cable. The largest converter stations with cables that are being used currently are 2 GW at 520 kV, so to achieve the 6 GW needed on Norwich to Tilbury, three sets of these HVDC systems would be required, with a minimum of three converters at each end of the connection.

Appendix D: Economic Appraisal of **7.19 2023 - Strategic Options Backcheck and Review [APP-357]** presents the costs, based on a transparent economic appraisal.

The following costs were set out at the hearing with all data from **7.19 2023 - Strategic Options Backcheck and Review [APP-357]** and all cost information defined by the fully transparent cost model for circuit alternatives in its Appendix D: Economic Appraisal.

On-shore	Wholey Overhead Line - Project Total EAN4 (AENC) + EAS2 (ATNC)	£894.50m	
	Majority Overhead Line - Project Total EAN4 (AENC) + EAS2 (ATNC) [with 20km Cable (consultation)]	£1,630.30m	*
	Wholey 4 Ended HVDC Option Project Total EAN4 (AENC) + EAS2 (ATNC)	£5,854.50m	*
Off-shore	Offshore 1 - Sub-optimal 2 Ended HVDC Option Norwich to Tilbury	£4,096.50m	
	Offshore 1 - 3 Ended HVDC Option Norwich to Bramford to Tilbury	£5,361.10m	*

***Transmission System Comparable Options - Delivering System Benefits of Connecting to Bramford**

The cost of a wholly overhead line, without any regard to any landscapes or any other environment constraints is presented as part of the initial appraisal. There is also a second cost, which includes the post-consultation view of the requirements to mitigate the landscape impacts, i.e. the cost with the

Item No.	ExA Description	Applicant's Response
		underground cable of £1.6 billion. In comparison, the cost of a wholly four-ended HVDC option is £5.8 billion. The Offshore 1 - suboptimal 2-ended HVDC option between Norwich and Tilbury would cost £4 billion. The reason it is suboptimal is because it does not have the connection with Bramford Substation, and therefore would not facilitate the connection of generation customers or give the same transmission capabilities as are provided in the proposed connection. To achieve the proposed same electrical capabilities, there is an option to have a three-ended link in Bramford Substation, so there would be three converters at Norwich, three converters at Tilbury, and three converters at Bramford Substation on a three-ended HVDC Voltage Source Converter (VSC) link. This would bring it to a similar technical capability as the proposed connection but would raise the price to £5.3 billion. It would also have no ability to connect the generation customers. The 'Essex Coast Generation Group' subsection in Section 3: Need Case of **7.17 Strategic Options Backcheck and Review [APP-355]** (SOBR) explains that the Applicant also has contracted connections for new generation and interconnectors located off the Essex Coast: • Five Estuaries Offshore Windfarm (1,080 MW by 2030) • North Falls Offshore Windfarm (1,000 MW by 2030) • Tarchon Energy Limited Interconnector (1,400 MW By 2030). This 3,480 MW of total generation requires connection in the region. The impact of these customers on the LE1 boundary is set out below. • For the LE1 boundary – LE1 boundary has deficit of without additional generation set out above -4,620 MW. – With Essex Coast generation of 3,480 MW included, the LE1 boundary deficit rises to -7,476 MW. **7.19 2023 - Strategic Options Backcheck and Review [APP-357]** sets out how the Applicant evaluated the options, taking into account the environmental assessment, socioeconomic aspects, technical benefits and the capital lifetime costs. This concluded that the need case was met by the onshore AC solution, in line with the NPS EN-1 and the Electricity Act 1989. It also integrates new customer connections within the Norwich to Tilbury project, in line with the transmission and licence obligations. It also assumes that the connection should be largely overhead, as aligned with NPS EN-5.

Item No.	ExA Description	Applicant's Response
		Hiorns Smart Energy Report The Applicant responded to the Hiorns smart energy report in April 2024, saying that it does not agree with the report's conclusions that a delay to 2035 would be possible. The requirement for energy security independence and net zero are to be achieved as soon as possible. The NESO Clean Power 2030 Report, Annex 2: Networks, Connections and network access analysis3, Section 2.4: Securing Works for a 2030 delivery, states that the requirements indicate that the project should be delivered sooner than 2031 if possible, and that a delay would have significant consequences to consumers of constraint costs and would impact the Applicant's obligations under the planning requirements and its transmission licence. Paragraph 2.8.5 of NP EN-5 makes it clear that the Applicant, as a transmission company, is required to facilitate generation, and this is reflected in its transmission licence obligation D2, an obligation to provide transmission services when requested. The delay to any investment would incur the cost of £2.7 billion, as set out in Annex 2 of the NES Clean Power 2030 report. The Applicant also notes constraints in the HVDC market, which are likely to make a HVDC alternative a deliverability risk even if there was a delay of five years. Where the Applicant is currently delivering HVDC projects, it is delivering 2 GW solutions. Norwich to Tilbury would require a 6 GW solution. Not only would there be constraints in delivering the cables, but also in the converter market and the specialist requirements that are needed as part of a HVDC installation, including access to cable-laying ships and equipment to do it. These are under extreme worldwide pressure with a number of companies seeking to use the limited HVDC resources that are available. The availability of HVDC circuit breakers is another technical limitation at the current time. This restricts any generation connecting to a HVDC network to 1,800 MW because, without the circuit breakers, the whole network would be lost. This would result in widescale transmission system problems and would be a breach of the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS), which is a requirement in the Applicant's licence, Condition D3: Transmission system security standard and quality of service.

[3] National Energy System Operator (2024) *Clean Power 2030 Annex 2: Networks, connections and network access analysis*.

Item No.	ExA Description	Applicant's Response
		Location specific alternative options The Applicant considered different combinations of options connecting to Bradwell Substation (raised in the Open Floor Hearings), as reported in **5.15 Design Development Report [APP-122]**. The challenge in all of them is the onward connection. The existing overhead line from Bradwell has operated at 132 kV in recent years and would need rebuilding as it is constrained by onward routing challenges towards Rayleigh and Tilbury. There have been other combinations of options raised in the Open Floor Hearings, including the combination of Norwich to Bramford, with Twinstead to Tilbury considered, at least on first reading, to be a lower cost combination. Again, those do not achieve the full need case, as these options do not provide that connection for the contracted customers. Adding that in makes it a more expensive option with the infrastructure requirement also having to connect to the transmission system. In terms of detailed alternatives, other options have been and continue to be considered as a result of consultation feedback and ongoing assessment. This includes comparing alternative corridors at individual locations, such as to the east of Ingatestone near Buttsbury Church. Alternatives were also considered for going around the National Landscape. The options appraisal and reasons for discounting options are set out in **6.3 Environmental Statement Chapter 3 - Alternatives [APP-127]**.
5.2	The above shall include a summary of its reasoning for the choice of overhead transmission lines instead of underground cables, choice of pylon size and design, and different types of transmission including offshore connections, including costings.	The reasoning for overhead lines is set out in the response to 5.1 above and is not repeated here. Pylon type alternatives A standard lattice pylon is the starting point for any overhead line as guided by National Policy Statement (NPS) EN-5 and the consideration of the mitigation hierarchy. There are two locations where the Applicant is proposing to change to the low-height lattice design. These are Little Waltham (sheets 3 and 4 of 2.3 Works Plans - Section F [APP-022]) for heritage reasons and keeping heights below and out of the view of some gardens, and the other location is Thurrock due to technical reasons for the airfield (sheets 1 and 2 of **2.3 Works Plans - Section H [APP-024]**). T-Pylons are considered in locations where the mitigation hierarchy identifies that lattice pylons are unacceptable. The Applicant did not identify any locations that met this on the Project.

2.3 Agenda Item 6 (Interrelationship with Other Developments)

Table 2.3 Item 6 (Interrelationship with Other Developments)

Item No.	ExA Description	Applicant's Response
6.1	The Applicant is to provide an update on the status of other projects which interrelate with the proposed development including: the production of the Interrelationship Report.	The Applicant confirmed that it is submitting **8.4.3 Report on Interrelationship with Other Infrastructure Projects [Revision A]** in accordance with the details requested in the **Rule 6 Letter [PD-009]**. This document includes updates regarding Lower Thames Crossing (LTC) and Five Estuaries Offshore Wind Farm since the Environmental Statement (ES) was produced. It also includes the emerging Tarchon interconnector project.
6.2a	The Applicant is to provide an update on the status of other projects which interrelate with the proposed development including a summary of the approach to continuing dialogue with the promoters or operators of those projects with regard to any provisions to be included in the draft DCO	Article 10, sub-articles 2 and 3 of **3.1 Draft Development Consent Order [APP-056]** (draft DCO), enables the Project to progress together with other projects, without there being a risk of enforcement action as a result of applying the Hillside principle, so that is the general provision that has been included to deal with interrelationships. Schedule 16 of the draft DCO deals with protective provisions. Part 6 relates to the Five Estuaries Offshore Wind Farm. The Applicant also anticipates that protective provisions will also be added into Schedule 16 for the benefit of the North Falls Offshore Wind Farm. There will also potentially be an additional requirement in Schedule 3 to control cumulative noise impacts in the vicinity of the new East Anglia Connection Node (EACN) Substation. There is provision in Schedule 6 and Schedule 9 of the draft DCO, for a 'with Lower Thames Crossing (LTC)' and also a 'without LTC' situation. The Applicant acknowledges that certain elements of the draft DCO are likely to require modification to ensure compatibility between LTC and this Project, and the Applicant is working with National Highways to agree the scope of that provision. The detailed drafting is likely to depend on resolving the other substantive matters that are being discussed. There is also a protective provision for National Highways in part 5 of Schedule 16. An update on the discussions with LTC is provided in **8.3.4 Statement of Common Ground with National Highways [Revision A]** submitted at Deadline 1.
6.2b	The Applicant is to provide an update on the status of other projects which interrelate with the proposed	The Applicant has shared survey information with Five Estuaries and North Falls offshore wind farms and has entered into a cooperation agreement, under which the parties are sharing information to minimise the need to carry out intrusive surveys. The Applicant has

Item No.	ExA Description	Applicant's Response
	development including a summary of the approach to surveys to be shared between projects.	also reviewed survey information from other developments where that has been available online and used this within its assessment. On LTC, the Applicant has shared its survey data and plans with National Highways to support the identification of the interfaces between the projects. The parties have also exchanged draft construction programmes. The Applicant received land plan data from LTC on 11 February 2026 which it will be using to inform the ongoing discussions. The Applicant has committed to share data with LTC going forward to enable the interactions to be explored, and resolutions to be identified.
6.2c	The Applicant is to provide an update on the status of other projects which interrelate with the proposed development including a summary of the approach to mitigation to be shared between projects.	The Applicant has shared mitigation proposals with Five Estuaries and North Falls Nationally Significant Infrastructure Projects (NSIPs) as part of its ongoing engagement. The Applicant's assessment has also been informed by the mitigation proposed for other developments, where this has been available online. The Project does not share mitigation with Lower Thames Crossing (LTC), but it does overlap with some of the mitigation and compensation areas include within the LTC DCO, which has granted.. The Applicant is aware that it will be required to provide sites to replace an area of nitrogen deposition mitigation, and also ancient woodland compensation. The Applicant has identified suitable sites for that replacement within its Order Limits, and it is in discussion with National Highways in respect of the detailed design and also the long-term management of those areas. The Applicant anticipates these arrangements will probably be secured through a side agreement rather than through provision in the DCO.
6.3	The Applicant is to provide an update on the status of other projects which interrelate with the proposed development including an indication of any additional statements of common ground (SoCG) to be submitted at Deadline 1.	The Applicant noted that 31 SoCGs were submitted with the application for development consent. There is anticipated to be an additional 60 SoCGs submitted at Deadline 1, i.e. 91 SoCGs submitted in total. There is a separate SoCG for Lower Thames Crossing (LTC) outside of the main National Highways SoCG relating to the strategic highway network. The Applicant confirmed that it regularly reviews resources and that it does have resources in place to actively engage with the third parties in order to reach proper agreement on the SoCGs within the Examination period.

3. Applicant's Response to ISH1 Actions

3.1 Response to Actions Under Agenda Item 4 (Scope of the Proposed Development)

Table 3.1 Response to Actions under ISH1 Agenda Item 4: Scope of the Proposed Development

Action No.	ExA Description	Applicant's Response
1 Limits of Deviation		
1a	Clarify what has influenced and enabled the bespoke change (such as narrowing) of the limits of deviation in certain locations, but not in other areas where there may be similar constraints	The Limits of Deviation (LoD) are a normal feature of Nationally Significant Infrastructure (NSIP) developments and represent the allowed maximum deviation for permanent features, such as the overhead line, pylons, Cable Sealing End (CSE) compounds, underground cables and new substations. This allows for adjustment to the final positioning and height of Project features to avoid localised constraints or unknown or unforeseeable issues that may arise. Table 4.3 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]** outlines the details of the LoD sought and therefore assessed within the Environmental Statement, which is secured by Article 5 and Requirement 4 of **3.1 Draft Development Consent Order [APP-056]** (draft DCO). Much of the design set out in the application is for reasons of proportionality and timing of a preliminary or indicative nature, and the draft DCO [**APP-056**] therefore allows flexibility in terms of location, detailed design and construction methods which is still to be confirmed by the relevant contractors. It reasonably avoids the need to react to on-the-ground constraints by the need for amendments to the DCO and is a settled route to meeting the needs of the Project in a proportionate manner. In some locations, which the Applicant has reviewed on a site-by-site basis, the lateral LoD have been reduced where practicable from the typical LoD described in **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**. These include, for example, where the Project is near known designated ancient woodlands, a County Wildlife Site, residential gardens, and technical grounds, e.g. proximity to

Action No.	ExA Description	Applicant's Response
		gas storage tanks. Reducing the LoD reduces the flexibility for delivery of the Project by the relevant contractor(s). In all locations that the LoD have been reduced, the Applicant has reviewed and assessed to ensure the Project can be delivered by the relevant contractor. Due to the preliminary nature of the indicative design it is a significant delivery risk to unduly restrict or reduce the LoD across the board pre-detailed design. This approach to flexibility is not unusual and aligns with precedents set by existing consented transmission projects.
1b	Clarify the process for refining limits of deviation post-consent, signposting to the relevant document(s)	The Applicant has outlined current prescriptive restrictions to the Limits of Deviation (LoD) within commitment GG34 in Table 6.1 of **7.2 Outline Code of Construction Practice [APP-300]**. Outside of those specific provisions, the consented LoD apply and provide the approved spatial envelope within which the Project is delivered. This is to allow for adjustments to the final positioning of Project features to avoid localised constraints or unknown or unforeseeable issues that may arise. As detailed design progresses, Main Works Contractors can refine layouts, construction methods and working practices to avoid or reduce impacts identified during assessment. These refinements do not require changes to the LoD, provided they remain compliant with the approved Development Consent Order (DCO) and do not give rise to any materially new or materially different environmental effects. The Project has a robust internal governance and assurance process to ensure compliance with the DCO, secured mitigation and consented design parameters throughout detailed design and delivery. Where additional LoD refinements are identified during examination, they will be captured in Table 6.1 of **7.2 Outline Code of Construction Practice [APP-300]** and secured by Article 5 of **3.1 Draft Development Consent Order [APP-056]**.
2 Existing Distribution Overhead Lines		
2	Provide a clear explanation of the difference between the distribution and transmission system, including the different types/sizes of pylons and overhead lines on the existing network	A simple analogy explaining the difference is to consider the transmission system as the equivalent of the motorway network moving a large number of vehicles with other roads (A-roads to single carriageway minor roads) the equivalent of the distribution system connecting to individual destinations. In this analogy, junctions on the motorway network would equate to substations on the electricity system.

Action No.	ExA Description	Applicant's Response
	which is affected by the proposed development.	Together, the transmission and distribution systems connect sources of electricity generation to consumers including homes and businesses. National Grid is responsible for the transmission system which moves electricity around the country. By operating predominantly at 400 kV (some sections operate at lower 275 kV), this system is capable of moving large quantities of power from large scale generation / storage sites to substations where connection to the distribution network is made. The distribution network operates at lower voltages ranging from 132 kV down to 11 kV and lower. Further details of overhead line structures are provided in Section 4.9 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**. In summary this explains that transmission scale infrastructure uses lattice pylons (of approximately 50 m height) on the majority of the transmission network including those areas modified by the Project (e.g. the YYJ line connecting into Tilbury) or considered for close parallel options (e.g. the 4YM line from Norwich to Bramford). T-pylons and low height lattice pylons are shorter and generally in the range 35 m to 40 m, but only low height lattice pylons are used on the Project (at two locations). The distribution system uses a mix of lattice pylons and wood pole structures. Most of the existing 132 kV and some 33 kV parts use lattice pylons ranging from around 26 m to around 30 m in height (e.g. the existing distribution network south of Bramford or at Haverings Grove where sections are to be replaced by underground cable). Other distribution connections use overhead line supported by wood poles which are around 10 m to 13 m in height.
3 Pylon Types		
3	Check the landscape and visual (and heritage where relevant) visualisations to clarify if existing pylons and overhead lines would remain in the view as presently seen, and label accordingly if necessary.	The methodology for producing the visualisations is set out in Section 13.6 of **6.13.A1 Environmental Statement Appendix 13.1 - Landscape and Visual Methodology [APP-227]**. Where the 132 kV overhead lines are proposed to be removed (third party mitigation works), this is reflected in the landscape and heritage viewpoint photomontages. These can be compared against the baseline. The Applicant therefore does not consider it necessary to add labels.
4 Underground Cables		

Action No.	ExA Description	Applicant's Response
4a	Provide full reasoning for the choice of underground cable type.	This has been discussed in Item 4.4 of Table 2.1 above. Where underground cable is used, the distance of connection becomes an important factor in determining the choice of alternating current (AC) or high voltage direct current (HVDC) underground cable types. This is because of the following: • The need for a large converter station at each end of each 2 GW connection. This means that three are required at each connection end for the required 6 GW capability. The total number will not be less than six converter stations but could be increased in response to the specific connection configuration sought. • The balance of cost favours AC schemes for schemes under 50 km with the transmission benefits of HVDC only becoming a factor for schemes longer than this. On this basis, for the four sections of underground cable, the longest of which is approximately 16 km, the use of AC cable is appropriate for the cable sections that form part of the Project.
4b	Explain the differences between the limits of deviation between 400kV undergrounding and 132kV undergrounding with use of cross sectional drawings.	The LoD allow for adjustment to the final positioning of the permanent features, for example to avoid localised constraints or unknown or unforeseeable issues that may arise. The key difference between the applied LoD of the 400 kV underground cables and the 132 kV underground cables is related to the smaller scale of the 132 kV assets. This can be seen on the illustrative cross section in Annex C2. Table 4.3 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]** provides details of the Order Limits and LoD for the Project, including the proposed 400 kV underground cables and the removal of existing and proposed underground cable diversion of 132 kV overhead lines. Paragraphs 4.8.65 to 4.8.78 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]** describe the works associated with the 400 kV underground cables. Paragraphs 4.8.90 to 4.8.98 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]** describe works associated with UK Power Networks 132 kV pylons, including works to remove, underground and divert. As stated in **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**, paragraph 4.8.66, the 400 kV underground cable 120 m construction corridor

Action No.	ExA Description	Applicant's Response
		includes typically six cable trenches for 18 cables (three cables per phase). Comparatively, in paragraph 4.8.96, the installation of the 132 kV underground cable diversions is assumed to be in a single trench typically up to 3 m in width.
4c	Clarify the width and depth of the trenches with reference to and provision of the cross sections as displayed at the hearing.	Each trench is excavated to 1.4 m depth with a base width of 2 m (giving a trench width at ground level of around 4.8 m assuming a stable soil slope). This is shown on **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-01 (Illustrative high voltage cable direct buried cross section and construction easement drawing). Further description of the installation methodology is provided in paragraphs 4.8.65 to 4.8.78 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**. The widths and depths are demonstrated in **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-01. The typical depth of the trenches is 0.9 m to the top of the cable protection tiles and 1.4 m to the bottom of the trench. Each trench is suitably spaced apart to allow for the required heat dissipation between cables and circuit phases. For each circuit as shown in **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-01, this is depicted as typically 2.2 m from the top of the trenches and 5 m from the bottom.
4d	Clarify the necessity and reasoning for deeper trenches for trenchless crossings.	The purpose of using trenchless techniques is to avoid or reduce effects on a particular feature, such as for example impact on a designated heritage asset buried underground, by installing the cables below the feature, **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-02 (Illustrative trenchless crossing standard detail), depicts an illustrative Horizontal Directional Drill (HDD) detail, the baseline method of trenchless installation for the Project. Cross Section B-B illustrates the HDD long section, and note 9 explains that the depth between existing surface level, track, utility or bottom of ditch (as appropriate) and top of duct is to be agreed with relevant stakeholders. Whilst the minimum required depth is set by the feature being avoided, other technical factors may also influence depth including the presence of suitable ground conditions.

Action No.	ExA Description	Applicant's Response
		As introduced in paragraph 4.8.71 of **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]**, trenchless installation methodologies such as HDD require greater separation between the cables for the appropriate heat dispersal to be achieved to allow them to maintain their effective capacity and also to allow for variability in the directional control achieved. The result is the need for a deeper cable depth and a wider working width compared with normal open cut techniques.
4e	Clarify if horizontal directional drilling is a continuous operation.	In general, Horizontal Directional Drilling (HDD) is completed as a continuous operation for each cable. The connection requires 18 cables to be installed with each cable requiring a separate drilling activity to be completed where HDD is the selected method. Once a drill has commenced, it is generally inadvisable to stop the process as doing so increases the risk of collapsed drills and failures. Commitments GH11 and GH12 in **7.2 Outline Code of Construction Practice [APP-300]** secure mitigation with regards to trenchless crossings and the loss of drilling fluid either through loss of fluids into permeable strata or breakout of fluids at the surface.
4f	Clarify extent of planting/ landscaping possible and/ or agricultural activities possible above the buried underground cables.	Normal agricultural cropping can occur above underground cables, but it would not be possible to construction buildings and plant trees above them . Paragraph 4.8.70 in **6.4 Environmental Statement Chapter 4 - Project Description [APP-130]** refers to this aspect. In summary we would expect normal agricultural cropping (grass, cereal, root and vegetables) to be resumed above underground cables. Uses involving support structures installed at depths presenting risk to the cables may also be able to continue by careful positioning of the structure/stake and it may also be possible to locally increase burial depth of cables. Replanting of hedgerows and establishment of scrub habitats would be acceptable, but it is not acceptable to replant trees nor establish buildings above the cable swathe.
5 Interested Party Comments		
Pylons East Anglia Ltd	What are the objectives that the project is trying to meet? Which alternatives were discounted as not meeting the	The objectives of the Project are manifold and are set by statute, National Policy Statements (NPSs), statutory guidance and ministerial and other guidance. In short, the Project seeks to meet the identified urgent need for critical national priority infrastructure in East Anglia identified in NPS EN-1 (see Sections 2 and 3) for

Action No.	ExA Description	Applicant's Response
	objectives and which were discounted on cost or other factors?	economic, security, sustainability and affordability reasons and in a manner consistent with the provisions and guidance of NPS EN-5 in accordance with the Applicant's statutory duties. The alternatives considered and the reasons for their being discounted are set out above and are reported in **7.17 Strategic Options Backcheck and Review [APP-355]**, **6.3 Environmental Statement Chapter 3 - Alternatives [APP-127]** and **5.15 Design Development Report [APP-122]**. NPS EN-1 makes it clear, in paragraph 4.3.22, that '*the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner; and only alternatives that can meet the objectives of the proposed development need to be considered*'. Paragraph 4.3.23 of NPS EN-1 states, '*The Secretary of State should be guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security, climate change, and other environmental benefits) in the same timescale as the proposed development*.' These objectives, as they flow from the Applicant's statutory duty, have become the nation's objectives following the publishing of Government statutory policy, in particular in NPS EN-5. The critical, urgent need for new transmission lines has become so much more than only grid capacity and the ways of providing it – the attention is now far more on the cost of not providing it in time.
Pylons East Anglia Ltd	What is the Applicant's case in relation to harm to the special qualities of the Dedham Vale National Landscape?	Paragraphs 2.9.21 to 2.9.23 of National Policy Statement (NPS) EN-5 require consideration of the effects (using the term 'harm') on a National Landscape. These are both the **direct** effects (i.e. physical effects on the designated area) and the **indirect** arising from infrastructure proposed outside the designated area. 'Harm' is not reported on in a Landscape and Visual Impact Assessment, the purpose of which is to identify effects in accordance with GLVIA3, as part of the Environmental Impact Assessment (EIA) process, but it is considered in the planning balance, given use of the term in the policy above. The purpose of a National Landscape is to '*conserve and enhance natural beauty*', as set out in the Countryside and Rights of Way Act 2000. The Special Qualities of

Action No.	ExA Description	Applicant's Response
		Dedham Vale National Landscape (DVNL) explain the aspects of natural beauty which are important for this nationally protected landscape. When considering effects on Special Qualities, the long term effects, during operation, on the National Landscape will not be significant, and therefore will not constitute 'harm' to these Special Qualities. There will however be some significant **visual** effects on views looking outwards from the DVNL. The fact that the Project will be visible from within the DVNL is not disputed, but the Applicant's position is that the long-term adverse effects on the Special Qualities of the National Landscape will not be significant (and so will not constitute 'harm'). Note that, in terms of indirect effects, the potential for effects on the Special Qualities of the DVNL was considered when siting the Cable Sealing End (CSE) compounds to the north of Raydon airfield and at Great Horkesley. In addition, there will be short to medium-term significant effects on the Special Qualities of DVNL during construction and after reinstatement, as a result of the work required to install underground cabling through this area, and the time taken for vegetation to become established, once the reinstatement work has been completed. This is because of the time it takes grassland to establish across disturbed areas, and for hedgerows and trees to grow. **6.13.A5 Environmental Statement Appendix 13.5 - National Landscape Assessment Study [APP-235]** presents the assessment of effects of the Project on DVNL. The assessment was undertaken taking into consideration the Special Qualities, which describe which aspects of natural beauty are important in the DVNL. The assessment was also informed by a Position Statement from the Dedham Vale National Landscape Partnership[4]. The Position Statement clarifies that: '*The National Landscape Partnership…considers the setting to the AONB to be the area within which development and land management proposals, by virtue of their nature, design, scale, siting, materials and colour have the potential to result in* ***substantial*** *impacts, positive or negative, on the natural beauty and special qualities of the AONB*.'

[4] Dedham Vale National Landscape Partnership (2024) *Development in the Setting of the Dedham Vale Area of Outstanding Natural Beauty (AONB) - Position Statement*.

Action No.	ExA Description	Applicant's Response
		[emphasis added]. It is considered (as informed by Paragraph 5.10.34 of NPS EN-1 (2024)) that the reference to 'substantial' impacts here is taken as meaning the 'likely significant effects' identified through the EIA for the Project. The Applicant has a statutory duty, in accordance with Section 85 of the Countryside and Rights of Way Act 2000, to seek to 'further the purposes' of the National Landscape. The Applicant confirms that this duty has been fulfilled as set out in **5.10 National Landscapes – Duty to Seek to Further the Purposes Report (s85 Countryside and Rights of Way Act 2000) [APP-120]**.
Pylons East Anglia Ltd	What alternatives were considered in relation to the location of EACN? Would any of these alternatives avoid the need to cross Dedham Vale National Landscape?	Overall, alternative locations for the East Anglia Connection Node (EACN) Substation closer to the coast as well as alternatives further inland have been considered. This was after locations in the general vicinity of Felixstowe were considered but not taken forwards. The selected location east of Ardleigh balances the effects arising from connection corridors and substations for the Applicant and for those with signed connection agreements and takes into consideration routeing of one of the Applicant's connections by underground cable. The preliminary location for the EACN Substation was developed as set out in **7.18 2022 – Corridor and Preliminary Routeing and Siting Study [APP-356]** as part of an iterative process also considering the onward connections. This document identifies the alternative sites considered at that stage of study. Other locations including the former Royal Air Force Boxted have been considered as they have been raised through consultation and the Applicant's position on them set out in the various **Design Development Reports [APP-122, APP-358, APP-359 and APP-360]**. Whilst noting that routeing through the National Landscape is not in conflict with National Policy Statement (NPS) EN-1 and NS EN-5, there were alternatives considered that would avoid routeing through the National landscape.
National Highways Lower Thames Crossing	How was LTC considered during the design development, site selection and assessment of alternatives in the Tilbury area? For example, the compensatory woodland and the conflict with the relocated travellers site?	The Applicant's initial alignment published in 2023 has always sought a balanced position and took Lower Thames Crossing (LTC) into account, proposing to install cables underneath LTC main carriageway, alongside other interests. As with other projects, the Applicant sought to identify those elements where there was potential for some potential flexibility. The introduction of Tilbury North Substation (especially now that Scenario B is being taken forwards) requires an approach with unavoidable

Action No.	ExA Description	Applicant's Response
		interfaces with LTC, but the Applicant is taking forward a Project where the interface is with elements where the LTC has locational flexibility. The Applicant has taken LTC into account since the early pre-application stages of the Project, as noted in the **Design Development Reports [APP-122, APP-358, APP-359 and APP-360]** submitted with the application for development consent. An example is **7.20 2023 - Design Development Report for the Project [APP-358]** dating from June 2023, where LTC is considered in paragraph 3.2.12 amongst others. The points raised by LTC are considered in Section 3 of **8.4.3 Report on Interrelationship with Other Infrastructure Projects [Revision A]**, submitted at Deadline 1.
National Highways Lower Thames Crossing	Was there a consideration of alternative sites to the north of Tilbury North substation considered, which would avoid a number of the key interfaces?	Yes, there was consideration of alternative sites further north including both immediately north of Orsett Golf Course (Site 4) and a further site just south of the A1013 (Stanford Lane). For both sites, the unavoidable need to make a connection to the south of Lower Thames Crossing (LTC) requires a crossing of the LTC works. Compared with the location taken forward at statutory consultation, the interface is unchanged in respect of the main carriageway. Site 3 increases the interface but for elements of LTC mitigation where it is the Applicant's position that provision of mitigation elsewhere is not unreasonable. The more northern sites present other constraints that are considered more disadvantageous. The consideration of alternative sites for the location of the new Tilbury North Substation is explained in Section 11.4 of **5.15 Design Development Report [APP-122]**; these include Site 4 to the north of the chosen Site 3. The reasons for selecting Site 3 and discounting other sites are provided in Section 11.4 of **5.15 Design Development Report [APP-122]**. The response to the point raised by LTC about a site further north is provided in Section 3 of **8.4.3 Report on Interrelationship with Other Infrastructure Projects [Revision A]**, submitted at Deadline 1.
Pylons East Anglia Ltd	Would there only need to be six converter stations if there was no break in the middle e.g. if EANC was not required?	The number of converter stations is set by the configuration of the connections made to the transmission system. A 6 GW high voltage direct current (HVDC) connection from Norwich to Tilbury (whether onshore or offshore) would need three converter stations at each end (six in total) but would not provide the means of connection for

Action No.	ExA Description	Applicant's Response
		customers with agreements in place to connect at the East Anglia Connection Node (EACN) nor the system flexibility that connection at Bramford provides. A spur to Bramford or the EACN could be included to address this but would require a further three converter stations (nine in total), or the connection could be broken at Bramford or the EACN requiring three converter stations on both the in and out connections at each break point making 12 in total if one break was made.
Pylons East Anglia Ltd	What would the increased capacity measures provide?	There are limitations as to what a circuit can carry, and these are defined by the International Electrotechnical Commission (IEC), who set ratings for 420 kV transmission, of 5,000 amperes being the highest available equipment. This equates to: a capacity on a single circuit of 3,465 MVA (megavolt-ampere), • a double circuit of 6,930 MVA, and • where there are four circuits remaining crossing a boundary after a fault, 13,860 MVA. The current post-fault capacities of: • EC5N – 2031 post fault capability 6,652 MVA, leaves a deficit of -7,520 MW • EC5 – 2031 post fault capability 13,552 MVA, leaves a deficit of -9,928 MW. These are operating within about 300 MW of the maximum capability, and therefore new infrastructure is required to meet the deficits. Therefore, additional circuits are required as increasing capacity is not possible without additional circuit infrastructure. Any measures to enhance existing capacity would breach the IEC 5000A rating for substation equipment.
Ardleigh and Little Bromley Parish Council	Can the Applicant provide a slide showing the trenching requirements of DC cables for comparison with the AC cables slide?	A comparable cross section for high voltage direct current (HVDC) was not provided in the submission as this form of cable is not proposed for the Project. An illustrative cross section is provided in Annex C1. This illustrates the likely arrangement given increased separation between sets of cables.

Action No.	ExA Description	Applicant's Response
Innova Renewables Limited	Can the LoD be reduced at my client's sites, particularly Hall Farm. There's an eastern swathe of land that at the moment that, at the moment, there's no proposal to put any infrastructure on that area, and that is the location of my client's consented development.	As outlined in design scenario 1 in Table 4.4 of **6.4 Environmental Statement Chapter 4 – Project Description [APP-130]**, the Limits of Deviation (LoD) were widened to the east to allow flexibility to change the overhead line alignment to run parallel to the existing 400 kV overhead line south out of Norwich Main Substation, should planning consent not be granted for the battery storage proposal. Consent for the battery storage proposals has been granted and the Applicant is progressing further resolution of detailed design interactions between the different projects to confirm the corridor. This requires further engagement to reach mutually acceptable agreement for all parties building on the progress made to date. We expect to find a resolution by Deadline 4.
Karl Owen	In regards of the ancient woodlands the LoD go right up to ancient woodland at RG140 and RG141. Why is there a buffer for ancient woodland in Essex, but not in Mid Suffolk?	The Applicant has followed a consistent approach with regards to reductions of the LoD, with the aim to avoid impacts on ancient woodlands where practicable. Reductions of the LoD at ancient woodlands is applied across the Project, not just within Essex, as shown on sheet 13 of **2.3 Works Plans - Section B [APP-018]**. For example, the LoD is reduced to avoid impact on Great Newton Wood Ancient Woodland. As shown on sheet 9 of **2.16 Trees and Hedgerows to be Removed and or Managed Plans - Section B [APP-049]**, 'The Thicket' woodland adjacent to span RG140 to RG141 is not classified as ancient woodland by either Natural England or the Applicant, therefore the LoD have not been reduced. The aforementioned woodland, adjacent to span RG140 to RG141, is identified as potentially affected should the overhead line move west on its LoD. At detailed design, the contractor would seek to retain as many trees as possible through commitments such as B15 and GG14 in **7.2 Outline Code of Construction Practice [APP-300]**.

3.2 Response to Actions Under Agenda Item 5 (Alternatives)

Table 3.2 Response to Actions under ISH1 Agenda Item 5: Alternatives

Action No.	ExA Description	Applicant's Response
6 Costs		
6	Provide a more detailed explanation around the presentation slide showing costings and with regard to net regret costs.	The following table sets out all of the figures shown in the presentation slide and the location of the data from **7.19 2023 - Strategic Options Backcheck and Review [APP-357]** all costs are in 2020/21 cost base The Wholly Overhead Line cost £894.5m (the pre-consultation cost considering the whole option provided by overhead line). The Majority Overhead Line option included the consultation sections of underground cable which mitigate the impact on the Nationally Designated Landscape as required by National Policy Statement (NPS) EN-5. These sections of cable, which form part of the EAS2 (ATNC) Bramford to Tilbury section, total circa 20 km and are the nearest proxy for the Project at £1,630.3m.

Data +B21:N39from 7.19 2023 - Strategic Options Backcheck and Review [APP-357] Cost base in 2020/21 prices

On-shore		EAN4 (AENC) OHL	EAS2 (ATNC) OHL	TOTAL	
	Wholly Overhead Line - Project Total EAN4 (AENC) + EAS2 (ATNC) Data from Table 10.1 page 80 + Data from Table 12.1 page 93	£355.20m	£539.30m	£894.50m	
		EAN4 (AENC) OHL	EAS2 (ATNC) OHL + Cable	TOTAL	
	Majority Overhead Line - Project Total EAN4 (AENC) + EAS2 (ATNC) [with 20km Cable] Derived by 7.19 2023 - Strategic Options Backcheck and Review [APP-357] Appendix D "Economic Appraisal"	£355.20m	£1,275.10m	£1,630.30m	*
		EAN4 (AENC) HVDC	EAS2 (ATNC) HVDC	TOTAL	
	Wholly 4 Ended HVDC Option Project Total EAN4 (AENC) + EAS2 (ATNC) Data from Table 10.1 page 80 + Data from Table 12.1 page 93	£2,381.50m	£3,473.00m	£5,854.50m	*
Off-shore		Offshore 1		TOTAL	
	Offshore 1 - Sub-optimal 2 Ended HVDC Option Norwich to Tilbury *Data from Table 14.2 page 110*	£4,096.50m		£4,096.50m	
		Offshore 1	Bramford HVDC Turn-in Cost	TOTAL	
	Offshore 1 - 3 Ended HVDC Option Norwich to Bramford to Tilbury *Data from paragraph 14.4.6 page 111*	£4,096.50m	£1,265.10m	£5,361.60m	*
*	Transmission System Comparable Options - Delivering System Benefits of Connecting to Bramford				

	Paragraph 14.4.6 referenced in the table above states: '*14.4.6 Should this circuit at full 6000 MW capacity made multiterminal to provide the same system flexibility as the AC circuit options. There would be a need for an additional three sets of HVDC convertor stations and three sets of 50km HVDC cable to connect to Bramford, to make multi-terminal HVDC links. This would add an additional £1,265.1m of capital cost and increase circuit lifetime cost by £1,587m. This would give overall capital costs of £ 5361.1m (£4,096.5m + £1,265.1m), and overall lifetime cost of £6,248m (£4,661m + £1,587m).*' Table 15.4 in **7.19 2023 - Strategic Options Backcheck and Review [APP-357]** showed a summary of the options that in combination could meet the need. An updated version of the table is attached to show how the Majority Overhead Line information has been calculated utilising Appendix D: Economic Appraisal of **7.19 2023 - Strategic Options Backcheck and Review [APP-357]** to provide full transparency of the numbers provided in the hearing.

7.19 2023 Strategic Options Backcheck and Review [APP-357] includes Table 15.4 page 122 in 2020/21 Cost Base

Boundary or Group	2020/21 Onshore Options				Offshore
EC5N	EAN 1 Necton to Pelham	EAN 2 Necton to Twinstead	EAN 3 Necton to Bramford	EAN 4 Norwich Main to Bramford	Offshore 1 Norwich Main to Tilbury
Economic Technology (Capacity)	OHL 115km (6930 MW)	OHL 90km (6930 MW)	OHL 85km (6930 MW)	OHL 80km (6930 MW)	
Capital Cost including non-circuit works	£494.5m	£494.2m	£375.1m	£355.2m	
Circuit 40yr Lifetime NPV Cost	£787m	£616m	£582m	£548m	
EC5 & LE1	EAS 1* Twinstead to Tilbury	EAS 2 Bramford via new substation to Tilbury	EAS 3 Bramford via Bradwell to Tilbury		
Economic Technology (Capacity)	OHL 80km (6930 MW)	OHL 100km (6930 MW)	OHL 130km (6930 MW)		HVDC 220km (6000 MW) [4000 MW]
Capital Cost including non-circuit works	£454.4m	£539.3m	£658.7m		£4,096.5m [£2,882.4m]
Circuit 40yr Lifetime NPV Cost	£548m	£684m	£890m		£4,661m [£3,232m]
SC2, EC5 & Sizewell	Sea Link Sizewell area to Richborough area				
Economic Technology (Capacity)	HVDC 145km 2000 MW				
Capital Cost including non-circuit works	£1,420.8m				
Circuit 40yr Lifetime NPV Cost	£1,197m				

2020/21 Cost Base Post Consultation inclusion of OHL and AC Cable section of 20kms added to EAS 2

EAS 2 Cable Section (after detailed appraisal and consultation outside SOR assessment) Bramford via new substation to Tilbury		
OHL	Cable	Total
80km	20km	100km
(6930 MW)		
£459.7m	£815.4m	£1,275.1m
£547m	£845m	£1,392m

Action No.	ExA Description	Applicant's Response

Section 4.3: NOA Cost Benefits Analysis of **7.17 Strategic Options Backcheck and Review [APP-355]** (SOBR) describes the original Least Worst Regrets Analysis carried out by the Electricity System Operator (ESO) (now referred to as the National Energy System Operator (NESO)). This exercise was only undertaken once by NESO and reflected within our report and is not National Grid Electricity options evaluation process. NESO are a fully independent organisation and undertake Least Worst Regrets Analysis as part of establishing proceed signals for projects. The NOA cost-benefit analysis identified the 'East 7' option as the highest ranking option from an economical perspective. This option is shown in Table 4.2 of the SOBR, which is reproduced below.

Table 4.2 Strategic Combination Proposal East 7

East 7 Capex £2,189.75m As East 6 with enhanced export capacity from EC5	AENC	Norwich-Bramford	AC OHL (Onshore)
	ATNC	Bramford-Tilbury	AC OHL (Onshore)
	SCD1	Richborough-Sizewell	HVDC Cable (Offshore)
	TENC	Tilbury-Grain	AC OHL (Onshore)

The NESO has continued to emphasise the need for this Project in the NESO Clean Power 2030 Report, Annex 2: Networks, Connections and network access analysis, Section 2.4: Securing Works for a 2030 delivery[5], which states:

'*There are three key schemes originally signalled as being delivered in 2030 in the Pathway to 2030, but where delivery will now be in 2031. The impact of these schemes is shown below. The percentages shown represent the difference in modelled percentage clean power generation across a typical year across the pathways.*

[5] National Energy System Operator (NESO) (2024) *Clean Power 2030, Annex 2: Networks, Connections and network access analysis*.

Table 1: Impact of key projects for delivery in 2031 if not accelerated

Project	Connections / Support	Impact on Clean Power / Constraint Impact		Latest Status from TOs
		Further Flex and Renewables	New Dispatch	
Norwich to Tilbury (AENC and ATNC)	Delivers new substation connecting • North Falls OWF • Five Estuaries OWF • Tarchon Interconnector Facilitates transfer of clean power through and out of East Anglia	-1.04% +£2.8 billion constraints in 2030	-1.0% clean power +£2.7 billion constraints in 2030	Planned for 2031
Sealink HVDC from Suffolk to Kent (SCD1)	Facilitates transfer of clean power through and out of East Anglia Required for connection of Five Estuaries OWF and firm connection of Rampion Extension	-0.6% +£1.4 billion constraints in 2030	-0.25% +£1.1 billion constraints in 2030	Planned for 2031

There is a significant capacity of offshore wind planned to connect this decade into East Anglia, which is a key enabler for clean power. Without the significant network capacity provided by these schemes a significant proportion of the wind power generated off East Anglia, around 23 TWh (in the Further Flex and Renewables pathway) will not be able to reach demand, leading to increased balancing costs and a need to replace some 4 TWh (in the same pathway) of this generation with unabated gas.'

NESO is the owner of the Least Worst Regrets Analysis and the owner of the model and data that produces the output balancing project costs against constraint costs. The NESO evaluations are reflected in **7.17 Strategic Options Backcheck and Review [APP-355]** Annex 2 of the NESO Clean Power 2030 Report, which represents the latest impact upon constraints.

Action No.	ExA Description	Applicant's Response
7 Pylon Design		
7	Provide additional information or signpost to the documentation regarding the rejection of T-pylons as an alternative design.	Appendix C – Consideration of Pylon Types in **7.21 2024 - Design Development Report for the Project Appendices** provides commentary as to the locations along the Project where the use of alternatives to traditional lattice pylons may be appropriate in landscape and visual terms, and within those areas, the technical considerations that would arise. The Applicant's position is set out at paragraphs 2.5.9 to 2.5.11 of **5.15 Design Development Report [APP-122]** and places pylon type as part of the mitigation hierarchy. The Applicant concludes that lattice pylons (including two locations for low height lattice pylons) are the preferred overhead line technology where there is not a reversal of the presumption for overhead lines. Whilst there may be areas where there is a design preference for T pylons, the need to mitigate for unacceptable effects from lattice pylons is not engaged and T pylons are not used on the Project.
8 Interested Party Comments		
Suffolk County Council and Little Bromley Parish Council	Further details requested on costs	The Applicant has submitted an updated Funding Statement at Deadline 1 (**4.2 Funding Statement [Revision B]**).
Pylons East Anglia Ltd	Would HVDC require three sets of cables, to be laid alongside each other? Obviously, subject to appropriate separation distances.	A 6 GW connection would require three sets of two high voltage direct current (HVDC) cables, each set being laid in a singular trench. From an electrical systems perspective these could be laid alongside each other, suitably spaced apart to allow for the required heat dissipation. However, this layout would introduce programme and construction constraints. Furthermore, it would not reduce the permanent easement required as the permanent rights for the haul road would need to be retained. Typically, the arrangement of the HVDC trenches would be similar to the high voltage alternating current (HVAC) cables as presented in **2.6.1 Design and Layout Plans - Subs and Cables [APP-041]**, AENC-MMAC-ENG-DWG-0085-02 (Illustrative trenchless crossing standard detail), albeit half as many trenches. Considering a 6 GW HVDC cross section for installation efficiencies, the haul road would be located in between the three trenches, with two trenches on one side and the

Action No.	ExA Description	Applicant's Response
		remaining trench on the other side. This would create an overall cable swathe of around 41 m in an 85 m construction swathe (refer to the figure in Annex C) compared with the indicative 50 m cable swathe for alternating current (AC) installation within a 120 m construction swathe. Standard practices for installation are based on two trenches being excavated at any one time, working on the two outer trenches and then in towards the middle trenches. This would be the same with the three trenches required for a HVDC connection. The Applicant would note that the effects from three converter stations to either side of the Dedham Vale National Landscape and the additional costs do not make the use of HVDC through the Dedham Vale National Landscape a viable basis for the Project to be taken forwards.
Pylons East Anglia Ltd	Was there a consideration of undersea cabling making landfall at Bradwell-on-Sea? What Bradwell-related alternatives were considered, having regard to potential usability of existing infrastructure?	In respect of alternatives to route via the old Bradwell power station, the Applicant has considered this as a connection point for the customers and as a waypoint for the connection between Norwich and Tilbury (in onshore and partially offshore connections). In all cases the onward connection assumes use of an existing overhead line connection to the Bradwell B site. This has been operating at lower voltage (132 kV) and has not been used for a few years and is in generally poor condition. This overhead line would need to be rebuilt but also interacts with a Special Protection Area; however, any rebuild to make this onward connection via Rayleigh to Tilbury is also constrained by urban development and further designations and some sections may need to be re-routed. All variants are considered less preferred through various combinations including additional interface with environmental designations, very constrained corridor for a connection to Tilbury, additional infrastructure requirement over and above the core Project or where the alternatives were not taken forwards due to being less economical and efficient. See also **5.1 - 2025 Consultation Report [APP-066]** - response code 9-2.756 and **7.20 - 2023 Design Development Report [APP-358]** - section 5.5.2-5.2.4.
Pylons East Anglia Ltd	Explain the reasoning for not selecting the Bradwell options?	Decision making on the Project has encompassed technical, environmental, socio-economic, programme and cost factors. Various factors and various combinations of factors have therefore formed the differentiators between alternatives, and there will be examples where cost is a clear differentiator when considered within the context of the Applicant's duties under the Electricity Act 1989. At the stage a decision was made not to progress with a high voltage direct current (HVDC) option via Bradwell, it was clear that there would be challenges to successful routeing via Bradwell to Tilbury but that none could conclusively rule the option out. Combined with the additional requirements to achieve connection of the customers (necessitating either converter station costs at Bradwell or alternative means of connecting to the Transmission System) and cost expected to be

Action No.	ExA Description	Applicant's Response
		of a similar order of magnitude to the offshore HVDC alternative, this provided a clear differentiator to a policy compliant (National Policy Statement (NPS) EN-1 and NPS EN-5) onshore predominantly overhead line alternative.
Pylons East Anglia Ltd	How did the Applicant decide on the location of EACN in the first place?	The preliminary location for the East Anglia Connection Node (EACN) was developed as set out in **7.18 2022 – Corridor and Preliminary Routeing and Siting Study [APP-356]** as part of an iterative process also considering the onward connections. This document identifies the alternative sites considered at that stage of study. Other locations including Royal Air Force Boxted have been considered as they have been raised through consultation and the Applicant's position on them set out in the various **Design Development Reports [APP-122**, **APP-358**, **APP-359** and **APP-360]**.

3.3 Response to Actions Under Agenda Item 6 (Interrelationship with Other Developments)

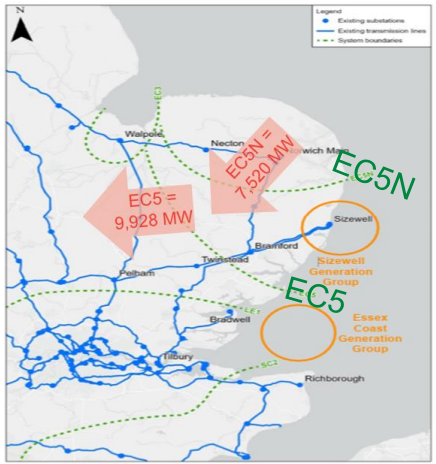
Table 3.3 Response to Actions under ISH1 Agenda Item 6: Interrelatonship With Other Projects

Action No.	ExA Description	Applicant's Response
9 Interested Party Comments		
Babergh and Mid Suffolk	Include reference to EcoPower Suffolk Solar in the interrelationship report as requested by Mid Suffolk District Council.	The Applicant has engaged with the developer of EcoPower Suffolk Solar as their project has progressed through land assembly. They have been considered in **8.4.3 Report on Interrelationship with Other Infrastructure Projects [Revision A]** submitted at Deadline 1.

Annex A. Applicant's Slides Presented During ISH1

nationalgrid

East Anglia Electrical Capacity Needs Case



- **7.17 Strategic Options Backcheck and Review [APP-355] Section 3 "Needs Case" table 3.3 page 31**

Table 3.3 Planned Transfer requirements

	Planned Transfer	Post Fault Capability by 2031	Planned Transfer Boundary Deficit
EC5N (Maximum)	15,774.0 MW	6,652 MW	-9,122 MW
EC5 (Maximum)	24,834.7 MW	13,552 MW	-11,531 MW
EC5N (Minimum)	14,171.7 MW	6,652 MW	-7,520 MW
EC5 (Minimum)	23,232.4 MW	13,552 MW	-9,928 MW

- **The highest 420kV (IEC) technical rating 5000 Ampere (A) rating – e.g. as identified for Circuit Breaker Ratings (IEC 62271-100)**
- **Equates Maximum Single circuit rating of 3,465 megavolt-ampere (MVA) per circuit**
- **Equates Maximum Double Circuit rating of 6,930 megavolt-ampere (MVA) per double circuit (i.e circuits either side of pylons).**
- **EC5 4 circuits Maximum Circuit rating of 13,860 megavolt-ampere (MVA) two sets of double circuit post fault.**

- EC5N – 2031 post fault **capability 6,652 MVA**, leaves a deficit of -7,520 MW
- EC5 – 2031 post fault **capability 13,552 MVA**, leaves a deficit of -9,928 MW

Environmental Consideration of Alternatives

Theoretical and conceptual alternatives

- **Consultation Report [APP-066]**
- **SOBR [APP-355]**

Strategic Options

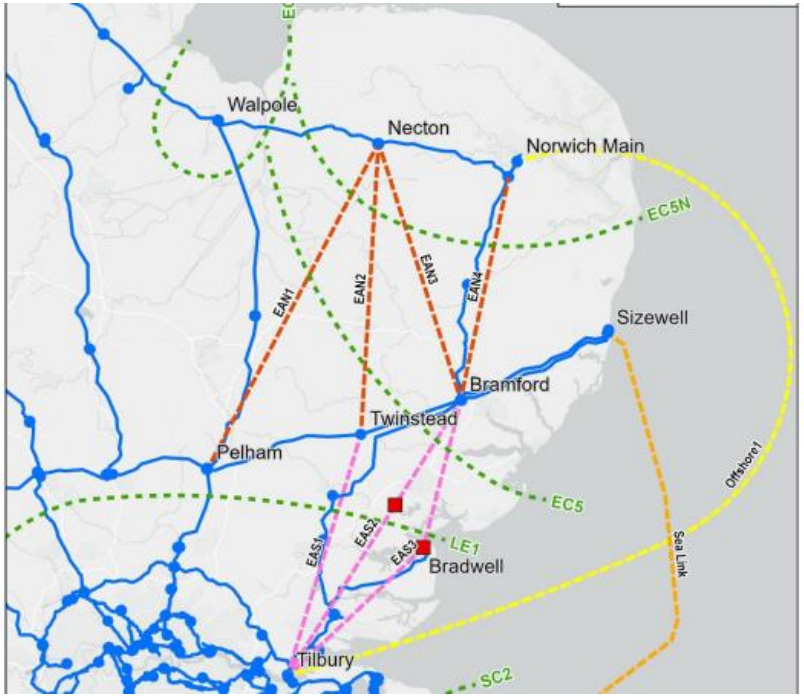
- **SOBR [APP-355]**
- **6.3 ES Chapter 3 – Alternatives [APP-127]**
- **DDR [APP-122]**

Reasonable Alternatives

- **6.3 ES Chapter 3 – Alternatives [APP-127]**
- **DDR [APP-122]**

Design Variants

- **Consultation Report [APP-066]**



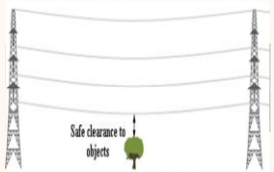
Approach to Alternative Methods of Electricity Transmission – Technology Overview

summary of data from 7.19 2023 - Strategic Options Backcheck and Review [APP-357] Appendix C "Technology Overview" and Appendix D "Economic Appraisal"

Technologies Evaluated for Onshore Circuits Options

Technologies Evaluated for Offshore Circuits Options

AC Overhead Line (OHL)



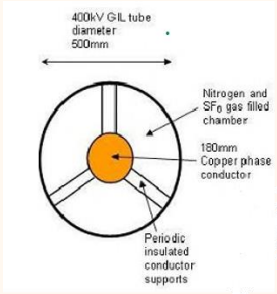
OHL Tower

2 Circuits

6 conductor Bundles

- Connection between Substations requires overhead line structures.
- No technical limitations over design distance

AC Gas Insulated Line (GIL)



GIL Tube

2 Circuits

12 tubes

- Connection between Substations requires buried GIL tubes, access and dust clean welding areas.
- Sections must be segregated into gas zones of no more than a few kms with gassing point access
- No buried installation of GIS has been built worldwide greater 10km in length.

AC Cable

AC Cable

2 Circuits

18 Cables

Capacitive Cable Gain requires Switching and Reactor Station every 20-30 kms

AC Cable

2 Circuits

18 Cables

- Connection between Substations requires buried cable either side of haul road.
- Due to AC capacitive effect of cable insulation method, reactive switching stations required every 20-30kms and operational switching limitations

HVDC Convertors & Cable

At Each Substation

6GW of HVDC Capacity

3 x 2GW Bi-poles

HVDC Cable

3 Bi-poles

6 Cables

At Each Substation

6GW of HVDC Capacity

3 x 2GW Bi-poles

- Multiple convertor stations required at each connection Substation
- Cable installation requires buried cables either side of Haul Road.
- HVDC cables do not generate capacitive effect

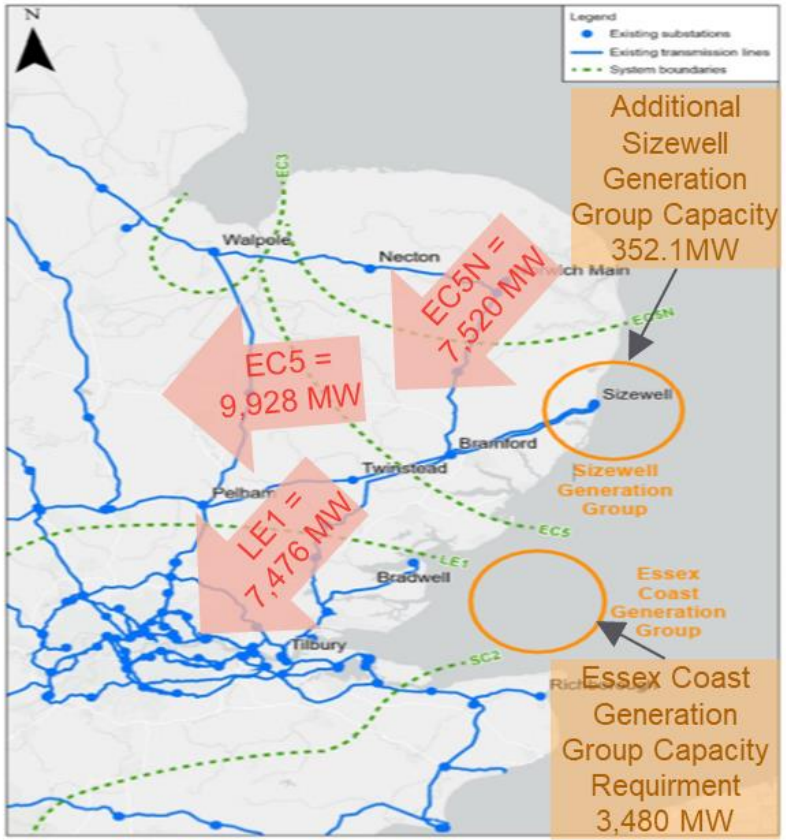
Approach to Alternative Methods of Electricity Transmission – Capital Cost Overview
2020/21 Cost Appraisal Base

All data from 7.19 2023 - Strategic Options Backcheck and Review [APP-357],
all cost information defined by the fully transparent cost model for circuit alternatives Appendix D "Economic Appraisal" within [APP-357]

On-shore	Wholey Overhead Line - Project Total EAN4 (AENC) + EAS2 (ATNC)	£894.50m	
	Majority Overhead Line - Project Total EAN4 (AENC) + EAS2 (ATNC) [with 20km Cable (consultation)]	£1,630.30m	*
	Wholey 4 Ended HVDC Option Project Total EAN4 (AENC) + EAS2 (ATNC)	£5,854.50m	*
Off-shore	Offshore 1 - Sub-optimal 2 Ended HVDC Option Norwich to Tilbury	£4,096.50m	
	Offshore 1 - 3 Ended HVDC Option Norwich to Bramford to Tilbury	£5,361.10m	*

***Transmission System Comparable Options - Delivering System Benefits of Connecting to Bramford**

Essex Coast Generation Customer Capacity Needs Case



- **7.17 Strategic Options Backcheck and Review [APP-355] Section 3 "Needs Case - Essex Coast Generation Group"**
- National Grid also has contracted connections for new generation, and interconnectors located off the Essex Coast
  - Five Estuaries Offshore Windfarm (1,080 MW by 2030)
  - North Falls offshore Windfarm (1,000 MW by 2030)
  - Tarchon Energy Limited Interconnector (1,400 MW By 2030)
- 3,480 MW of total generation.
- **Also, the impact of these customers on the LE1 boundary is set out below**
- For the LE1 boundary
  - has deficit of -4,620 MW.
  - when Essex Coast generation of 3,480 MW
  - deficit rises to -7,476 MW

Preliminary Conclusions Norwich to Tilbury

APP-355 Strategic Options Backcheck and Review [APP-355]

Sets out how we evaluated options taking into account Environmental assessment topics, socio-economic topics, technical benefits including capital and lifetime costs.

National Grid concluded:

- ***Need Case met by onshore solution – EN1 paras 3.3.81, Electricity Act 1989***
- ***Integrate new customer connections with NtoT- Transmission Owner Licence Obligations condition D2***
- ***Connection should be largely overhead – EN5 paras 2.9.7 and 2.9.20***
- ***Use of underground cable in National Landscapes – EN5 paras 2.9.21***
- ***Consideration of underground cable in other areas – EN5 para 2.9.23 (detail not for today but subsequent ISHs)***

The combination of overhead line options EAN 4 and EAS 2 (Norwich Main to Bramford and Bramford via a new EACN substation to Tilbury) satisfies the need case.

Timing of Alternatives Raised by Stakeholders

East Anglia Transmission Network Reinforcements – Hiorns Smart Energy Networks (The Hiorns Report)

- The Applicant responded in April 2024 to the Hiorns Smart Energy Networks in September 2023, and our response is available on the Project website.
- In summary we do not accept the Report's conclusions around the timing being closer 2035 than 2030.
- Delay would have significant consequences for cost to consumers and our obligations.
- Delay would incur significant constraint costs Of £2.7bn*
- Market Constraints in the HVDC market, delay would not make an offshore alternative deliverable.

*NESO Guidelines - NESO - Clen Power 2030 Report - Annex 2 "Networks, Connections and network access analysis" – Section 2.4 "Securing Works for a 2030 delivery"

Offshore Coordination

- NPS-1 3.3.71 and NPS-5 2.71 in the context of offshore coordination was seeking to maximise the coordination of offshore windfarms such that a single connection could be utilised by a number of projects and gaining economies of scale.

- Overarching NPS-1 also states

  - *3.3.81 The importance of accelerating coordination does not, however, militate against the need for standalone electricity networks projects, and these projects are supported by this NPS and should continue to be assessed on their own merits*

- HVDC alternatives include the lack of commercially availability HVDC circuit breakers.*
- This restricts offshore HVDC networks to generation infeed of **1800MW.**
- Without HVDC Circuit Breakers, Integrated HVDC network with generation above **1800MW** would shut down under fault
- This would lead to a widescale and significant transmission system issues.

* **As out in the DNV Network Topology Report commissioned by the System Operator Page 66 Section 9.3.1**

Network Enhancement Alternatives Suggested by Stakeholders

- **The (IEC) 5000 A equates to a maximum continuous circuit rating of 3,465 megavolt-ampere (MVA) per circuit or 6,930 megavolt-ampere (MVA) per double circuit (i.e circuits either side of pylons).**

- **LineVison Dynamic Line Rating (DLR)**
  - Enables real time ambient conditions circuit ratings.
- **TS Conductor**
  - High Temperature Low Sag (HTLS) conductor
- **Super Conductors**
  - Low maturity transmission at level Liquid Nitrogen cooled conductors.
- **Power Flow Control and Transmission Switching**
  - Moves power around the network to maximise utilisation.
- **EC5 Constraint Management Intertrip**
  - System to Generator Intertrips only used during planned outages
- **Interconnector Operation**
  - Interconnectors between the UK and Europe are commercially independent systems.

- **As the existing system is meeting the IEC 5000Ampre (A), existing enhancement is not possible and new circuit infrastructure required.**

Network Route Alternatives Suggested by Stakeholders

Bradwell - various alternatives

- Various alternatives suggested and responded to through consultation feedback process. These include routeing onwards from Tendring peninsula or as landing point for HVDC, both options potentially involving relocation of EACN

- National Grid position that all less preferred. The existing OHL operating at 132kV needs rebuild and is constrained by routeing challenges onwards to Rayleigh and Tilbury with effects on SPA

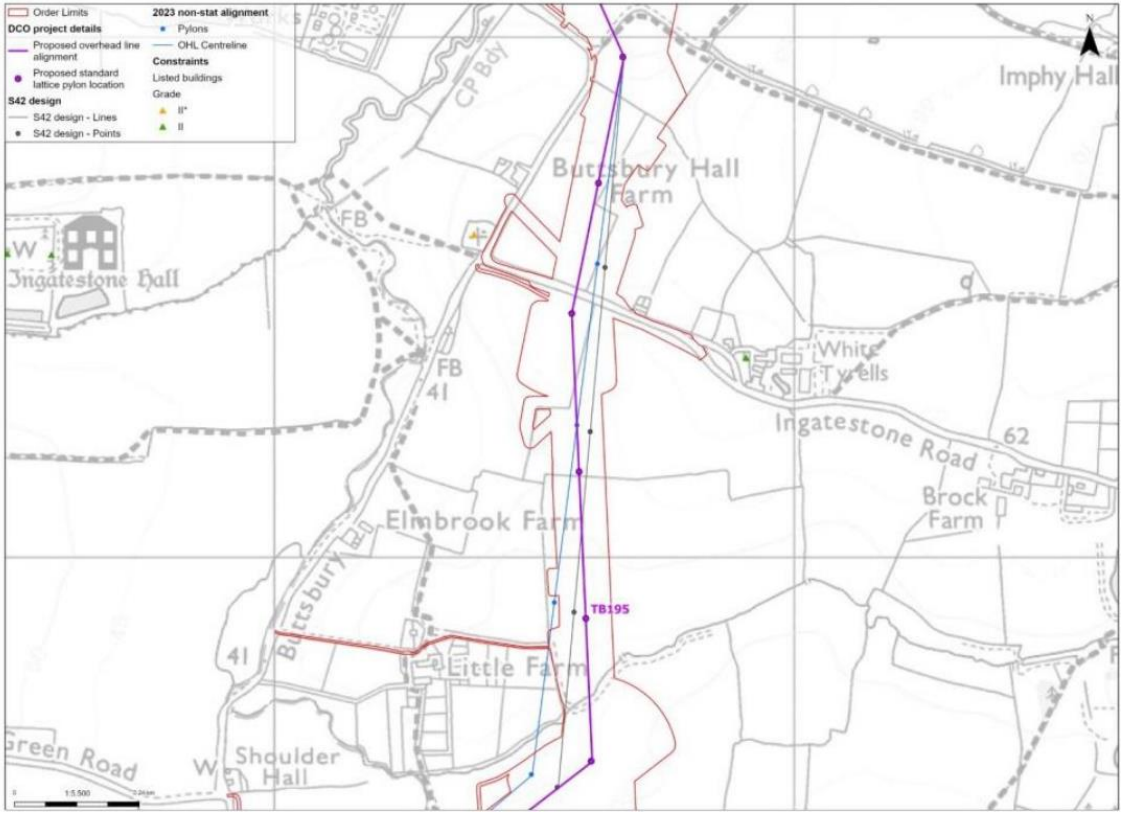
Norwich to Bramford with Twinstead to Tilbury

- A combination of EAN4 OHL Norwich Main to Bramford and EAS 1 – Twinstead to Tilbury was ruled out due to the requirement for an additional £500m of cost required to connect the Essex Coast generation group and rebuilding of Twinstead substation as set out in 7.19 2023 - Strategic Options Backcheck and Review [APP-357] Section 15 “Options Appraisal Conclusions” page 123

- Other alternatives and design variants we expect to be covered in future ISH's'

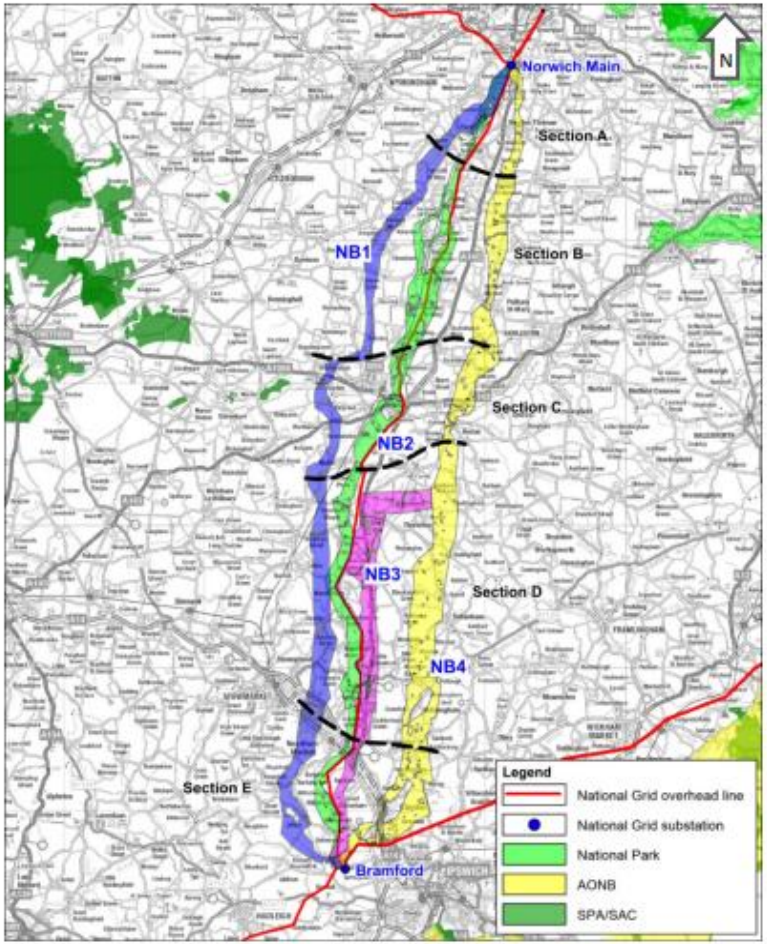
From Strategic Option to the Project

Consultation feedback and ongoing assessments - changes



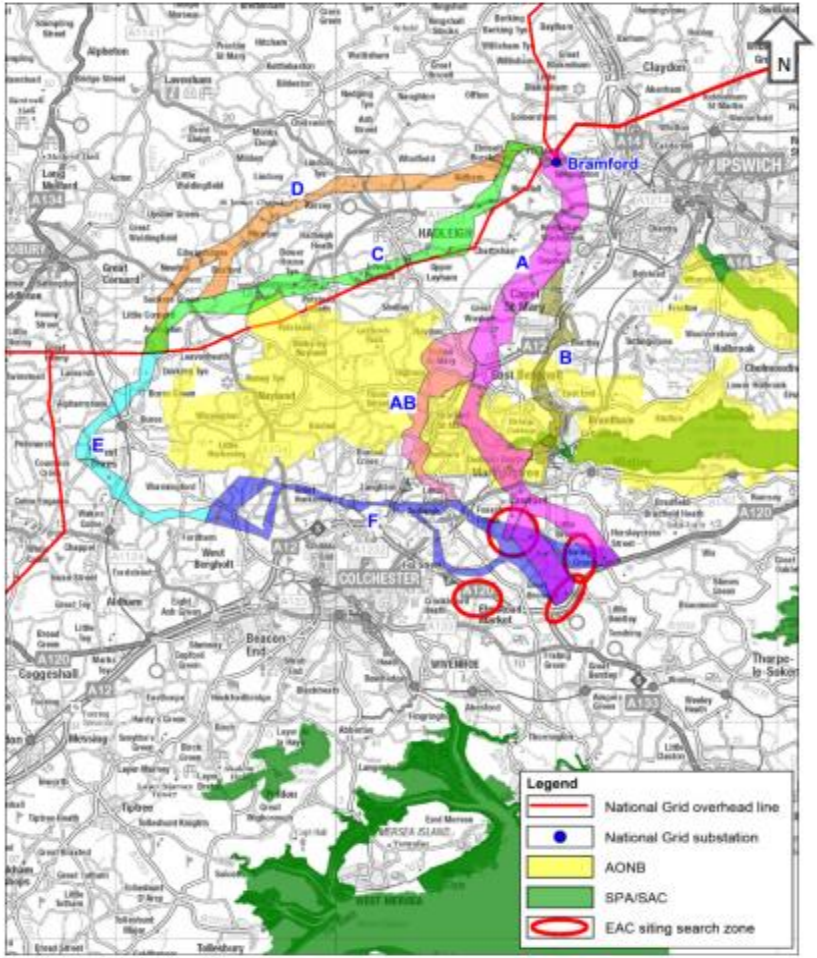
Example of why predominantly overhead - Norwich to Bramford

Image 3.3 Norwich Main Substation to Bramford Substation initial options (not to scale) - as taken from CPRSS (National Grid, 2022)



Considering reversal of presumption - Bramford to EACN

Image 3.6 Bramford Substation to EACN Substation options (not to scale) – as taken from CPRSS (National Grid, 2022)



Pylon Type

Image 4.15 Typical suspension steel lattice pylon[25]

Image 4.17 Typical low height lattice pylon (suspension (left) and tension pylon (right))[25]

e pylon Image 4.4 – T-pylon

Annex B. Location of Construction Compounds

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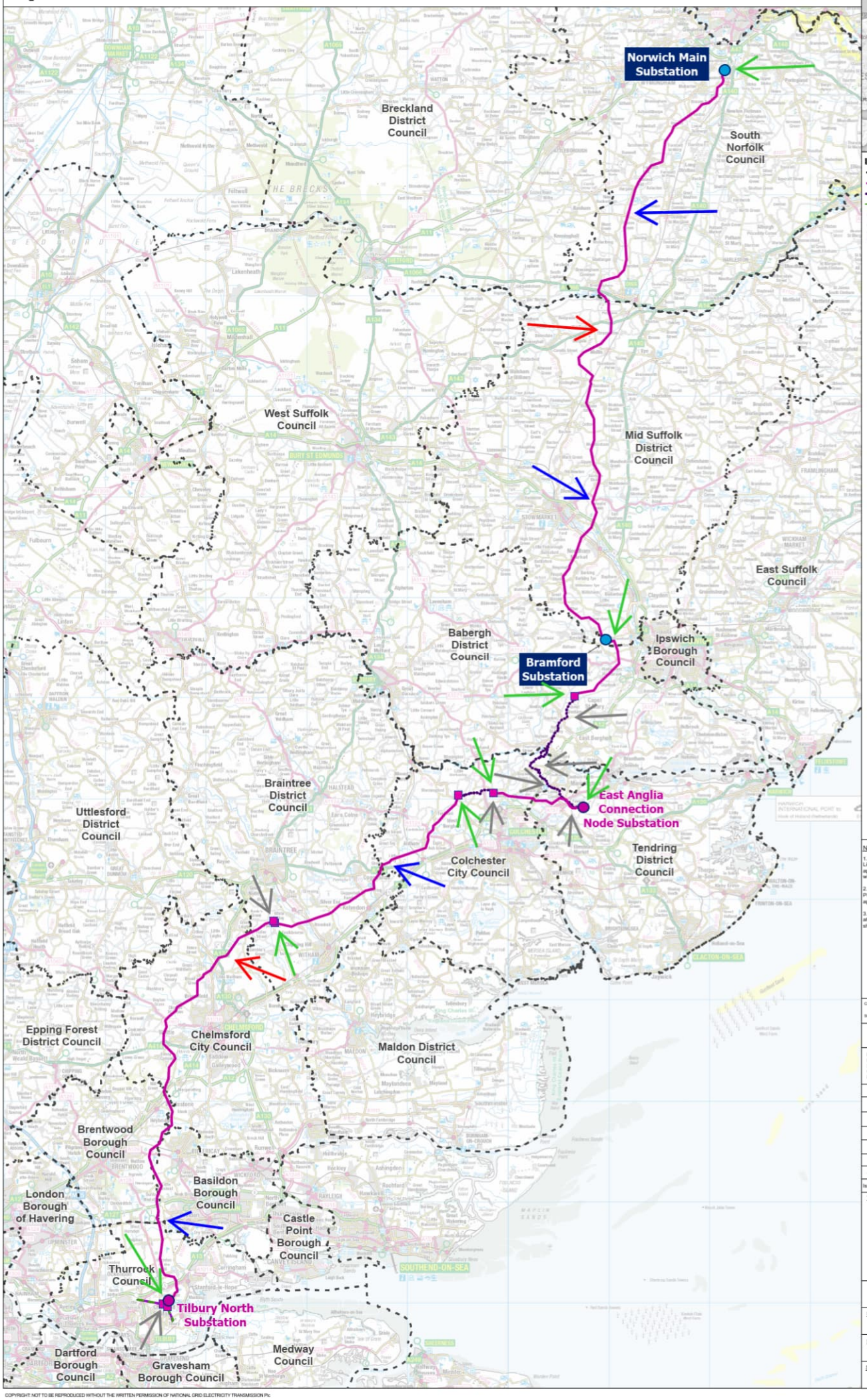
Application Document 2.1

THE NATIONAL GRID (NORWICH TO TILBURY) ORDER
OVERALL LOCATION PLAN
REGULATION 5(2)(o)
(SHEET 1 OF 2)



Legend

- Local authority boundary
- Proposed overhead line
- Proposed underground cable centreline
- Existing overhead line - to be modified
- New substation
- Existing substation
- New cable sealing end compound

Notes

1. These plans are indicative and the Project will sit within the Order Limits. Due to the need for future flexibility, National Grid will be applying for Order Limits and Limits of Deviation within its DCO, within which any final alignment would lie.

2. For additional detail on the plan suites, please refer to the Guide to Plans (document reference 2.0), located in the Volume 2 of the DCO application.

3. This drawing is scaled at paper size A0, therefore any prints taken at smaller sizes will affect accuracy of the measurement units and should not be scaled against.

Coordinate System: British National Grid

Sheet X Centroid Coordinate: 550477 Sheet Y Centroid Coordinate: 249384

0 2 4 6 8 10 12 Kilometres

Issue	Date	Remarks	Drawn	Checked	Approved
A	AUG-2025	For DCO submission	MG	TH	KR

Title

THE NATIONAL GRID
(NORWICH TO TILBURY) ORDER
OVERALL LOCATION PLAN
REGULATION 5(2)(o)
(SHEET 1 OF 2)

nationalgrid

PINS Application Number: EN020027

National Grid Drawing Reference: AENC-LSTC-ENG-DWG-0001

Scale	Sheet Size	Sheet	Issue
1:125,000	A0	SHEET 1 OF 2	A

Annex C. Additional Cross Sections

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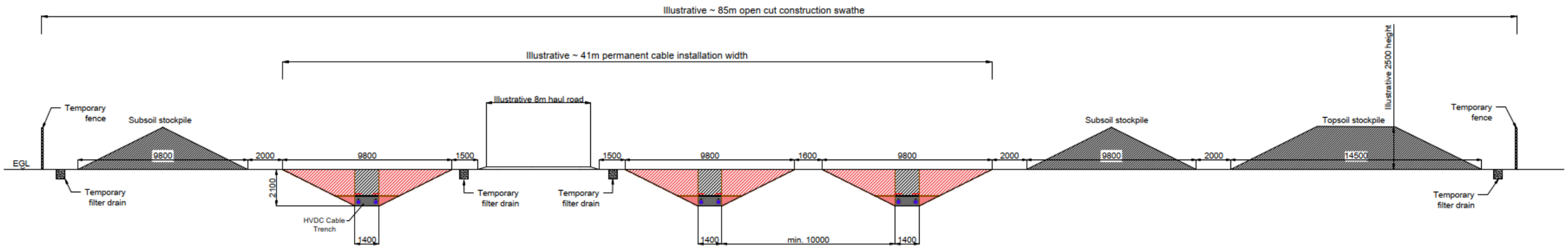
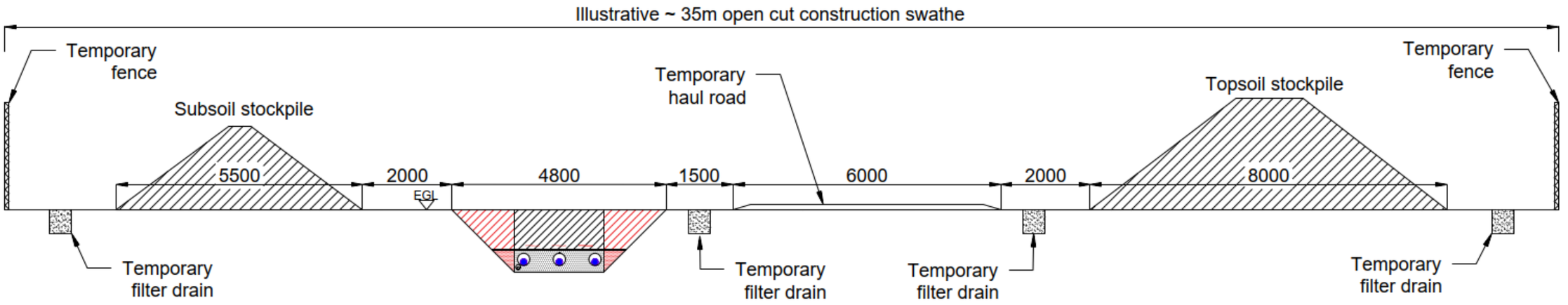
Annex C
Additional Cross Sections

Figure C.1 Illustrative Cross Section of a High Voltage Direct Current Working Width



Illustrative swathe for open cut construction for HVDC cabling works

Figure C.2 Illustrative Cross Section of a UK Power Networks High Voltage Alternating Current Working Width



Illustrative swathe for open cut construction for 132kV UKPN cabling works

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