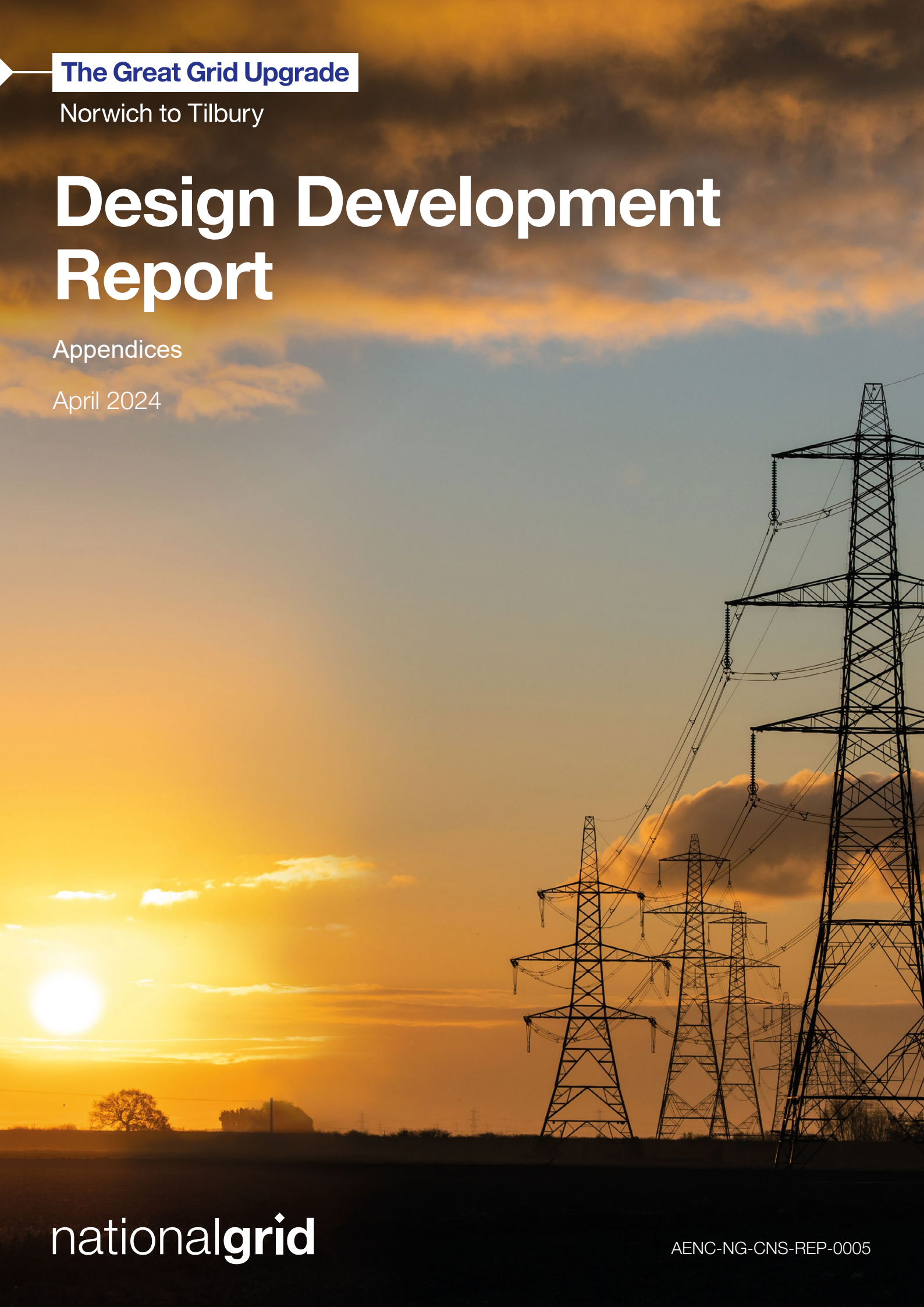
The Great Grid Upgrade

Norwich to Tilbury

Design Development Report

Appendices

April 2024



nationalgrid

AENC-NG-CNS-REP-0005

Norwich to Tilbury

Design Development Report:

Appendix A – Consideration of National Policy Statements

April 2024

nationalgrid

Contents

Abbreviations

DCO	Development Consent Order
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report

1 Introduction

1.1 Purpose of this document

1.1.1 National Policy Statements (NPS) are produced by Government through a process which includes public consultation and parliamentary scrutiny and approval. They present the planning policy framework for decision making for Nationally Significant Infrastructure Projects (NSIPs) and are produced for different types of infrastructure development. They set out national policy, including the need for the infrastructure in question and the Government's policy for meeting that need, and include the Government's objectives for the development of nationally significant infrastructure.

1.1.2 The Overarching NPS for Energy (NPS EN-1) was designated in January 2024. The NPS for Electricity Networks Infrastructure (NPS EN-5) was also designated in January 2024 and sets out the Government's policy for nationally significant electricity transmission networks and, together with NPS EN-1 sets the information that should be provided alongside any application for development consent to satisfy their requirements.

1.1.3 In addition, the NPS for Renewable Energy (NPS EN-3) includes support for the onshore infrastructure required to deliver new offshore wind developments.

1.1.4 This appendix sets out the NPSs designated in January 2024 as these are the policies which will be considered by the Secretary of State in reaching a decision.

2 Overarching National Policy Statement for Energy (EN-1)

2.1 General guidance

2.1.1 The Overarching NPS for Energy (NPS EN-1) was designated in January 2024.

2.1.2 NPS EN-1 sets out the Government's overarching policy about the development of NSIPs in the energy sector. It emphasises the need for new energy projects to contribute to a secure, diverse, reliable and affordable energy supply.

2.1.3 NPS EN-1 sets out the goal of decarbonising the energy network to achieve net zero whilst ensuring security of supply. It sets out how as the electricity system grows in scale, dispersion, variety, and complexity, work would be needed to protect against the risk of large-scale supply interruptions in the absence of sufficiently robust electricity networks. It states that while existing transmission and distribution networks must adapt and evolve to cope with this reality, development of new transmission lines of 132 kV and above would be necessary to preserve and guarantee the robust and reliable operation of the whole electricity system. It refers to the substantial volume of onshore reinforcement works to the transmission network needed to meet decarbonisation targets, and specifically refers to substantial reinforcement in East Anglia to handle increased power flows from offshore wind generation (paragraph 3.3.68).

2.1.4 NPS EN-1 recognises that *to 'produce the energy required for the UK and ensure it can be transported to where it is needed, a significant amount of infrastructure is needed at both local and national scale. High quality infrastructure is crucial for economic growth, boosting productivity and competitiveness'* (paragraph 2.1.3).

2.1.5 NPS EN-1 sets out the Government's objective of the UK achieving net zero by 2050 and through the Net Zero Strategy: Build Back Greener[1] the Government has set out a vision for transitioning to net zero. For the energy sector, the Government's objectives are to ensure that the supply of energy always remains secure, reliable and affordable. Meeting these objectives necessitates a significant amount of new infrastructure both to generate and transport energy. Paragraph 3.2.6 of EN-1 states that '*The Secretary of State should assess all applications for development consent for the types of infrastructure covered by this NPS on the basis that government has demonstrated that there is a need for those types of infrastructure which is urgent, as described for each of them in this Part'.* Paragraph 3.2.7 goes on to state that '*In addition, the Secretary of State has determined that substantial weight should be given to this need when considering applications for development consent under the Planning Act 2008'.*

2.1.6 Section 3 of NPS EN-1 outlines the role of different types of electricity infrastructure, including electricity networks which are required to deliver the Government's energy objectives. Paragraph 3.3.65 of the NPS states that '*There is an urgent need for new electricity network infrastructure to be brought forward at pace to meet our energy objectives*' and paragraph 3.3.66 notes that '*the security and reliability of the UK's current and future energy supply is very highly dependent on having an electricity network which*

[1] HM Government (October 2021) https://assets.publishing.service.gov.uk/media/6194dfa4d3bf7f0555071b1b/net-zero-strategy-beis.pdf

will enable new renewable energy generation, storage and interconnection infrastructure that our country needs to meet the rapid increase in electricity demand required to transition to net zero while maintaining energy security. The delivery of this important infrastructure also needs to balance costs to consumers, accelerated timelines for delivery and the minimisation of community and environmental impacts'.

2.1.7 NPS EN-1 outlines that aside from connecting new sources of electricity generation with new sources of demand there are other drivers for new electricity network infrastructure. Paragraph 3.3.67 states that '*As the electricity system grows in scale, dispersion, variety and complexity, work will be needed to protect against the risk of large-scale supply interruptions in the absence of sufficiently robust electricity networks…..development of new lines of 132kV (and over 2km) and above will also be necessary to preserve and guarantee the robust and reliable operation of the whole electricity system'.*

2.1.8 Paragraph 3.3.71 references how the previous approach to connecting offshore wind has resulted in individual radial connections developed project-by-project. Whilst this may continue to be the most appropriate approach for some areas with single offshore wind and / or offshore infrastructure, where there are multiple windfarms or offshore transmission projects it is expected that a more coordinated approach will be delivered. Paragraph 3.3.72 states that '*Connecting the volume of offshore wind capacity targeted by the government will require not only new offshore transmission infrastructure but also reinforcement to the onshore transmission network, to accommodate the increased power flows to regional demand centres'.*

2.1.9 NPS EN-1 acknowledges that the consenting of onshore reinforcements can take significant time noting at paragraph 3.3.73 that '*completion of these onshore reinforcements has often taken longer than the completion of the offshore wind farms for which they are being built'.* As a consequence, delays could present a material barrier to the delivery of the Government ambition to deliver up to 50 GW of offshore wind by 2030. Furthermore, paragraph 3.3.79 outlines that delays in the approval of associated new network developments could cause significant economic waste and set back the strategically vital goals of decarbonisation and energy security. NPS EN-1 references the benefits of a strategic approach to network planning, paragraph 3.3.74 states that '*The strategic approach to network planning, including the Holistic Network Design (HND) for onshore-offshore transmission infrastructure, planned HND follow-on exercises and the proposed moved to Centralised Strategic Network Planning for the onshore-offshore network, allows for clearer identification of needs and includes upfront consideration of environmental and community impacts'*.

2.1.10 The different elements of an offshore wind and multi-purpose interconnector may be consented separately. Paragraph 3.3.77 acknowledges that development consent applications may not include the full chain of consents (including connection to the grid). However, development consent applications '*should include details of how connected infrastructure will be consented, how cumulative impacts will be assessed and whether any necessary consents, permits and licences have been obtained'.*

2.1.11 Paragraph 3.3.83 states that '*Given the urgent need for new electricity infrastructure and the time it takes for electricity NSIPs to move from design conception to operation, there is an urgent need for new (and particularly low carbon) electricity NSIPs to be brought forward as soon as possible, given the crucial role of electricity as the UK decarbonises its economy*'.

The Critical National Priority for Low Carbon Infrastructure

2.1.12 NPS EN-1 Section 4 sets out the assessment principles for NSIP applications relating to energy infrastructure including the presumption in favour of granting consent to applications for energy NSIPs which applies unless more specific and relevant policies set out in the NPSs clearly indicate consent should be refused and subject to certain provisions of the Planning Act. Section 4.2 sets out the Government's commitments to prioritise for low carbon infrastructure. Paragraph 4.2.1 states that the Government has committed to fully decarbonise the power systems by 2035, subject to security of supply, to underpin its 2050 net zero ambitions. Paragraph 4.2.4 states that the Government has therefore concluded that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure. Paragraph 4.2.5 lists the types of infrastructure which are nationally significant low carbon infrastructure for the purposes of the CNP policy and this includes electricity grid infrastructure in the scope of NPS EN-5, including network reinforcement, upgrade works and associated infrastructure such as substations.

2.1.13 Paragraph 4.2.10 states that '*Applicants for CNP infrastructure must continue to show how their application meets the requirements in this NPS and the relevant technology specific NPS, applying the mitigation hierarchy, as well as any other legal and regulatory requirements'*. Paragraph 4.2.11 sets out that '*Applicants must apply the mitigation hierarchy and demonstrate that it has been applied. They should seek the advice of the appropriate SNCB or other relevant statutory body when undertaking this process. Applicants should demonstrate that all residual impacts are those which cannot be avoided, reduced or mitigated'*. Furthermore, applicants should set out how residual impacts will be compensated for (as far as possible) and set out how those measures will be monitored and reported upon.

2.1.14 Paragraph 4.2.15 states that '*where residual non-HRA and non-MCZ impacts remain after the mitigation hierarchy has been applied, these residual impacts are unlikely to outweigh the urgent need for this type of infrastructure. Therefore, in all but the most exceptional circumstances, it is unlikely that consent will be refused on the basis of these residual impacts'*. The exception to this presumption of consent are residual impacts which present an unacceptable risk to, or unacceptable interference with, human health and public safety, defence, irreplaceable habitats or unacceptable risk to the achievement of net zero, flood and coastal erosion risk.

2.1.15 As set out in Paragraph 4.2.16 of EN-1, *'the Secretary of State will take as the starting point for decision making that [CNP] infrastructure is to be treated as if it has met any tests which are set out within the NPSs, or any other planning policy, which requires a clear outweighing of harm, exceptionality or very special circumstances*'. This means that the Secretary of State will take as a starting point that CNP Infrastructure will meet the following, non-exhaustive, list of tests (as set out in paragraph 4.2.17):

- '*Where development within a Green Belt requires very special circumstances to justify development;*
- *Where development within or outside a Site of Special Scientific Interest (SSSI) requires the benefits (including need) of the development in the location proposed to clearly outweigh both the likely impact on features of the site that make it a SSSI, and any broader impacts on the national network of SSSIs;*
- *Where development in nationally designated landscapes requires exceptional circumstances to be demonstrated; and*

- *Where substantial harm to or loss of significance to heritage assets should be exceptional or wholly exceptional'*.

2.1.16 Paragraph 4.2.18 sets out that any Habitats Regulations Assessment (HRA) residual impacts will continue to be considered under the framework set out in the Habitats Regulations with paragraph 4.2.19 stating that '*Where, following Appropriate Assessment, CNP Infrastructure has residual adverse impacts on the integrity of sites forming part of the UK national site network, either alone or in combination with other plans or projects, the Secretary of State will consider making a derogation under the Habitats Regulations*'.

Environmental Effects/Considerations

2.1.17 NPS EN-1 Section 4.3 sets out the requirements for all proposals that are subject to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) to be accompanied by an Environmental Statement (ES) describing the aspects of the environment likely to be significantly affected by the project.

2.1.18 Paragraph 4.3.4 requires that applicants '*consider the potential effects, including benefits, of a proposal for a project, the applicant must set out information on the likely significant environmental, social and economic effects of the development, and show how any likely significant negative effects would be avoided, reduced, mitigated or compensated for, following the mitigation hierarchy. This information could include matters such as employment, equality, biodiversity net gain, community cohesion, health and well-being'*.

2.1.19 Paragraph 4.3.12 states that '*Where some details are still to be finalised, the ES should, to the best of the applicant's knowledge, assess the likely worst-case environmental, social and economic effects of the proposed development to ensure that the impacts of the project as it may be constructed have been properly assessed*'.

2.1.20 Paragraph 4.3.15 states that '*Applicants are obliged to include in their ES, information about the reasonable alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility'*.

2.1.21 With regard to the Secretary of State decision making, paragraph 4.3.18 sets out that the Secretary of State should consider the worst-case impacts in the consideration of an application and consent, providing some flexibility in the consent to account for uncertainties in specific project details. Paragraph 4.3.20 identifies that the Government has 13 legally binding targets for England under the Environment Act 2021 and that meeting these targets will be a shared endeavour across government and accordingly the Secretary of State should have regard to the ambitions, goals and targets set out in the Government's Environmental Improvement Plan 2023.

2.1.22 Paragraph 4.3.22 states that '*Given the level and urgency of need for new energy infrastructure, the Secretary of State should, subject to any relevant legal requirements (e.g. under the Habitats Regulations) which indicate otherwise, be guided by the following principles when deciding what weight should be given to alternatives.*

- *The consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner; and*
- *only alternatives that can meet the objectives of the proposed development need to be considered*'.

2.1.23 Furthermore, Paragraph 4.3.24 states that '*The Secretary of State (SoS) should not*

refuse an application for development on one site simply because fewer adverse impacts would result from developing similar infrastructure on another suitable site and should have regard as appropriate to the possibility that all suitable sites for energy infrastructure of the type proposed may be needed for future proposals'.

2.1.24 Any alternatives presented not in accordance with policies set out in the relevant NPS are unlikely to be relevant to the Secretary of State's decision (Paragraph 4.3.26) and those which are not commercially viable or on physically unsuitable sites (Paragraph 4.2.27) or proposals which are vague or immature (Paragraph 4.3.28) should be excluded from the Secretary of State's decision.

2.1.25 Paragraph 4.3.29 states '*It is intended that potential alternatives to a proposed development should, wherever possible, be identified before an application is made to the Secretary of State (so as to allow appropriate consultation and the development of a suitable evidence base in relation to any alternatives which are particularly relevant). Therefore, where an alternative is first put forward by a third party after an application has been made, the Secretary of State may place the onus on the person proposing the alternative to provide the evidence for its suitability as such and the Secretary of State should not necessarily expect the applicant to have assessed it'.*

Health

2.1.26 NPS EN-1 Paragraph 4.4.2 notes that '*Energy infrastructure has the potential to impact on the health and well-being ('health') of the population. Access to energy is clearly beneficial to society and to our health as a whole. However, the construction of energy infrastructure and the production, distribution and use of energy may have negative impacts on some people's health'*. Paragraph 4.4.2 recognises the '*direct impacts on health may include: increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation, and increases in pests'*.

2.1.27 Paragraph 4.4.4 states that '*where the proposed project has an effect on humans, the ES should assess these effects for each element of the project, identifying any potential adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate'.*

2.1.28 Paragraph 4.4.6 encourages '*opportunities to be taken to mitigate indirect impacts by promoting local improvements to encourage health and wellbeing, this includes potential impacts on vulnerable groups'.*

2.1.29 Paragraph 4.4.7 states that '*Generally, those aspects of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either by themselves constitute a reason to refuse consent or require specific mitigation under the Planning Act 2008'.*

Biodiversity Net Gain

2.1.30 NPS EN-1 Paragraph 4.6.2 states that biodiversity net gain is an essential component of environmental net gain. Projects in England should consider and seek to incorporate improvements in natural capital, ecosystem services and the benefits they deliver when planning how to deliver biodiversity net gain.

2.1.31 Paragraph 4.6.7 requires '*applicants for onshore elements of any development are encouraged to use the latest version of the biodiversity metric to calculate their biodiversity baseline and present planned biodiversity net gain outcomes. This calculation data should be presented in full as part of their application'.*

2.1.32 Paragraph 4.6.10 states '*Biodiversity net gain should be applied after compliance with the mitigation hierarchy and does not change or replace existing environmental obligations, although compliance with those obligations will be relevant to the question of the baseline for assessing net gain and if they deliver an additional enhancement beyond meeting the existing obligation, that enhancement will count towards net gain'.*

2.1.33 With reference to off-site biodiversity net gain NPS EN-1 Paragraph 4.6.12 states that '*Developments should do this in a manner that best contributes to the achievement of relevant wider strategic outcomes, for example by increasing habitat connectivity, enhancing other ecosystem service outcomes, or considering use of green infrastructure strategies. Reference should be made to relevant national or local plans and strategies, to inform off-site biodiversity net gain delivery. If published, the relevant strategy is the Local Nature Recovery Strategy (LNRS). If an LNRS has not been published, the relevant consenting body or planning authority may specify alternative plans, policies or strategies to use'.*

2.1.34 Paragraph 4.6.15 states that *'Applications for development consent should be accompanied by a statement demonstrating how opportunities for delivering wider environmental net gains have been considered, and where appropriate, incorporated into proposals as part of good design (including any relevant operational aspects) of the project'.*

2.1.35 Paragraph 4.6.1(Secretary of State decision making) states that '*Although achieving biodiversity net gain is not currently an obligation on applicants, Schedule 15 of the Environment Act 2021 contains provisions which, when commenced, mean the Secretary of State may not grant an application for a Development Consent Order unless satisfied that a biodiversity gain objective is met in relation to the onshore development in England to which the application relate'.*

2.1.36 Paragraph 4.6.3 (Secretary of State decision making) states that '*The Secretary of State should give appropriate weight to environmental and biodiversity net gain, although any weight given to gains provided to meet a legal requirement (for example under the Environment Act 2021) is likely to be limited'.*

Good Design

2.1.37 NPS EN-1 Paragraph 4.7.1 recognises the '*Visual appearance of a building, structure, or piece of infrastructure, and how it relates to the landscape it sits within, is sometimes considered to be the most important factor in good design. But high quality and inclusive design goes far beyond aesthetic considerations. The functionality of an object – be it a building or other type of infrastructure – including fitness for purpose and sustainability, is equally important*'. Paragraph 4.7.2 follows on to this stating that '*It is acknowledged, however that the nature of energy infrastructure development will often limit the extent to which it can contribute to the enhancement of the quality of the area'*. Paragraph 4.7.6 sets out that '*Whilst the applicant may not have any or very limited choice in the physical appearance of some energy infrastructure, there may be opportunities for the applicant to demonstrate good design in terms of siting relative to existing landscape character, land form and vegetation. Furthermore, the design and sensitive use of materials in any associated development such as electricity substations will assist in ensuring that such development contributes to the quality of the area. Applicants should also, so far as is possible, seek to embed opportunities for nature inclusive design within the design process'*.

2.1.38 Paragraph 4.7.7 states that '*Applicants must demonstrate in their application documents how the design process was conducted and how the proposed design evolved. Where a*

number of different designs were considered, applicants should set out the reasons why the favoured choice has been selected'.

2.1.39 Paragraph 4.7.10 states '*Given the importance which the Planning Act 2008 places on good design and sustainability, the Secretary of State needs to be satisfied that energy infrastructure developments are sustainable and, having regard to regulatory and other constraints, are as attractive, durable, and adaptable (including taking account of natural hazards such as flooding) as they can be'.*

2.1.40 Paragraph 4.7.12 adds to the above stating that '*The Secretary of State should take into account the ultimate purpose of the infrastructure and bear in mind the operational, safety and security requirements which the design has to satisfy. Many of the wider impacts of a development, such as landscape and environmental impacts, will be important factors in the design process'.*

Climate Change Adaptation and Resilience

2.1.41 NPS EN-1 Paragraph 4.10.1 encourages climate change adaption and resilience by stating that '*If new energy infrastructure is not sufficiently resilient against the possible impacts of climate change, it will not be able to satisfy the energy needs as outlined in Part 3 of this NPS*'.

2.1.42 Paragraph 4.10.8 states that '*New energy infrastructure will typically need to remain operational over many decades, in the face of a changing climate. Consequently, applicants must consider the direct (e.g. site flooding, limited water availability, storms, heatwave and wildfire threats to infrastructure and operations) and indirect (e.g. access roads or other critical dependencies impacted by flooding, storms, heatwaves or wildfires) impacts of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of new energy infrastructure'.*

2.1.43 Paragraph 4.10.9 states that '*The ES should set out how the proposal will take account of the projected impacts of climate change, using government guidance and industry standard benchmarks such as the Climate Change Allowances for Flood Risk Assessments, Climate Impacts Tool, and British Standards for climate change adaptation, in accordance with the EIA Regulations'.* Paragraph 4.10.10 also requires applicants to *'assess the impacts on and from their proposed energy project across a range of climate change scenarios, in line with appropriate expert advice and guidance available at the time'.*

2.1.44 Paragraph 4.10.14 states that '*Should a new set of UK Climate Projections or associated research become available after the preparation of the ES, the Secretary of State (or the Examining Authority during the examination stage) should consider whether they need to request further information from the applicant'.*

2.1.45 Paragraph 4.10.16 states that '*If any adaptation measures give rise to consequential impacts (for example on flooding, water resources or coastal change) the Secretary of State should consider the impact of the latter in relation to the application as a whole and the impacts guidance set out in Part 5 of this NPS'.*

Network Connection

2.1.46 NPS EN-1 Paragraph 4.11.1 states that the '*Connection of a proposed electricity generation plant to the electricity network is an important consideration for applicants wanting to construct or extend a generation plant*'. Furthermore, Paragraph 4.11.4 reiterates the position set out in Section 4.2 of NPS EN-1 that transmission network infrastructure, and related network reinforcement and upgrade works, associated with

nationally significant low carbon infrastructure is considered as CNP Infrastructure.

2.1.47 Paragraph 4.11.6 states that '*Applicants may wish to take a commercial risk where they have not received or accepted a formal offer of a grid connection from the relevant network operator at the time of the application. In this situation applicants should provide information as part of their application confirming that there is no obvious reason why a network connection would not be possible'.*

2.1.48 The Government envisages that wherever reasonably possible, applications for new generating stations and related infrastructure should be contained in a single application to the Secretary of State or in separate applications submitted in tandem and in an integrated way, as outlined in EN-5. Paragraph 4.11.8 acknowledges that it may not be possible to coordinate applications due to different lead in times and promoted by different legal entities subject to different commercial and regulatory frameworks. Where separate applications are made, the applicant should include information confirming that there are no obvious reasons for why other elements are likely to be refused.

2.1.49 NPS EN-1 Paragraph 4.11.12 states that '*The Secretary of State should be satisfied that appropriate network connection arrangements are/will be in place for a given project regardless of whether one or multiple (linked) applications are submitted'.*

Pollution Control and Other Environmental Regulatory Regimes

2.1.50 NPS EN-1 Paragraph 4.12.7 states that '*Applicants should make early contact with relevant regulators, including EA or NRW and the MMO, to discuss their requirements for Environmental Permits and other consents, such as marine licences'.*

2.1.51 Paragraph 4.12.9 states that '*In considering an application for development consent the Secretary of State should focus on whether the development itself is an acceptable use of the land or sea, and the impact of that use, rather than the control of processes, emissions or discharges themselves'.*

2.1.52 Paragraph 4.12.10 states that '*The Secretary of State should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity, will be properly applied and enforced by the relevant regulator. The Secretary of State should act to complement but not seek to duplicate them'.*

2.1.53 As set out in Paragraph 4.12.15 '*Working in close cooperation with the EA or NRW and/or the pollution control authority, and other relevant bodies, such as the MMO, the SNCB, Drainage Boards, and water and sewerage undertakers, the Secretary of State should be satisfied, before consenting any potentially polluting developments, that:*

- *The relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework;*
- *The effects of existing sources of pollution in and around the site are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits'.*

2.1.54 Paragraph 4.12.16 states that '*The Secretary of State should not refuse consent on the basis of pollution impacts unless there is good reason to believe that any relevant necessary operational pollution control permits or licences or other consents will not subsequently be granted*'.

Safety

2.1.55 The Health and Safety Executive (HSE) is identified as the independent regulator for workplace health and safety and is responsible for enforcing a range of health and safety legislation, some of which is relevant to the construction, operation and decommissioning of energy infrastructure. Paragraph 4.13.5 of NPS EN-1 sets out the requirement for applicant to consult with the HSE on matters relating to safety.

Common Law Nuisance and Statutory Nuisance

2.1.56 NPS EN-1 Paragraph 4.15.5 sets out that an applicant, at the application stage of an energy NSIP should consider the possible sources of nuisance under section 79(1) of the Environmental Protection Act 1990 and how they may be mitigated or limited to allow for appropriate requirements to be included in any subsequent order granting development consent.

Security Considerations

2.1.57 NPS EN-1 Paragraph 4.16.1 and 4.16.2 state that national security considerations apply across all national infrastructure sectors and that DESNZ works closely with government security agencies to provide advice to the most critical infrastructure assets on terrorism and other national security threats. Paragraph 4.16.4 states that *'Government policy is to ensure that, where possible, proportionate protective security measures are designed into new infrastructure projects at an early stage in the project development. Where applications for development consent for infrastructure covered by this NPS relate to potentially 'critical' infrastructure, there may be national security considerations*'. Where national security implications have been identified, the applicant should consult with relevant security experts to ensure security measures have been adequately considered in the design process and that adequate consideration has been given to the management of risks.

2.2 Generic Impacts

2.2.1 Section 5 of NPS EN-1 considers generic impacts of any of the types of energy infrastructure projects covered by the energy NPSs, in respect of matters such as air quality and emissions, biodiversity, dust and odour, flood risk, historic environment, landscape, land use, noise, and vibration, socio-economic, traffic and transport and waste management.

Air Quality and Emissions

2.2.2 NPS EN-1 Paragraph 5.2.1 states that '*Energy infrastructure development can have adverse effects on air quality. The construction, operation and decommissioning phases can involve emissions to air which could lead to adverse impacts on health, on protected species and habitats, or on the wider countryside and species*.

2.2.3 Paragraph 5.2.3 states that '*For many air pollutants there is not a threshold below which there is no health impact so it is important that energy infrastructure schemes consider not just how a scheme may impact statutory air quality limits, objectives or targets but also measures to mitigate all emissions in order to minimise human exposure to air pollution, especially for those who are more susceptible to the impacts of poor air quality'.*

2.2.4 Paragraph 5.2.8 states that '*Where the project is likely to have adverse effects on air*

quality the applicant should undertake an assessment of the impacts of the proposed project as part of the ES'. Paragraph 5.2.9 lists the matters that should be covered by the ES:

- '*existing air quality concentrations and the relative change in air quality from existing levels;*
- *any significant air quality effects, mitigation action taken and any residual effects, distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;*
- *the predicted absolute emissions, concentration change and absolute concentrations as a result of the proposed project, after mitigation methods have been applied; and*
- *any potential eutrophication impacts'*.

2.2.5 Paragraph 5.2.13 states '*The Secretary of State should consider whether mitigation measures are needed both for operational and construction emissions over and above any which may form part of the project application. A construction management plan may help codify mitigation at this stage'*.

Greenhouse Gas Emissions

2.2.6 NPS EN-1 Section 5.3 details the requirement for applicants to prepare a Greenhouse Gas (GHG) assessment as part of their ES. This should include:

- Whole life GHG assessment showing construction, operational and decommissioning impacts;
- Explanation of the steps that have been taken to drive down the climate change impacts;
- Measurement of embodied GHG impact from the construction stage;
- How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures;
- How operational emissions have been reduced as much as possible;
- Calculation of operational energy consumption and associated carbon emissions;
- Whether and how any residual GHG emissions will be (voluntarily) offset or removed using a recognised framework; and
- Where there are residual emissions, the level of emissions and the impact of those on national and international efforts to limit climate change.

Biodiversity and Geological Conservation

2.2.7 NPS EN-1 Section 5.4 (Biodiversity and Geological Conservation) outlines the Government objective to halt overall biodiversity loss in England by 2030 and then reverse loss by 2042, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people. Paragraph 5.4.3 sets out that there is a wide range of legislative provisions at the international and national level that can impact on planning decisions affecting biodiversity and geological conservation.

Habitats Regulations

2.2.8 The highest level of biodiversity protection is afforded to sites identified through international conventions. The Habitats Regulations set out sites for which a HRA will assess the implications of a plan or a project, Special Areas of Conservation and Special Protection Areas. Paragraph 5.4.5 states that the following should be given the same protection as sites covered by the Habitats Regulations and that an HRA will also be required:

- Potential Special Protection Areas and possible Special Areas of Conservation;
- Listed or proposed Ramsar sites; and
- Sites identified, or required, as compensatory measures for adverse effects on any of the other sites covered by this paragraph.

Sites of Special Scientific Interest

2.2.9 NPS EN-1 Paragraph 5.4.8 states that '*development on land within or outside a SSSI, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits (including need) of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national networks of SSSIs'*.

Regional and Local Sites

2.2.10 NPS EN-1 Paragraph 5.4.12 outlines that sites of regional and local biodiversity and geological interest make an important contribution to ecological networks and nature's recovery. National planning policy expects plans to include policies that not only secure their protection but also to enhance them and their connection to wider ecological networks.

2.2.11 Paragraph 5.4.15 identifies that Ancient Woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. The Government is committed to maintaining and enhancing existing areas of ancient woodland.

2.2.12 Paragraph 5.4.17 states that '*where the development is subject to EIA [Environmental Impact Assessment] the applicant should ensure the ES [Environmental Statement] clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance,…on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity, including irreplaceable habitats'.*

2.2.13 Paragraph 5.4.19 states that '*the applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests*' while Paragraph 5.4.20 states that '*applicants should consider wider ecosystem services and benefits of natural capital when designing enhancement measures'.*

2.2.14 Paragraphs 5.4.25 – 5.4.34 sets out the requirements in relation to the applicants' assessment. It sets out the need to seek the advice of the appropriate Statutory Nature Conservation Body (SNCB) to inform the preparation of a HRA and to determine if an Appropriate Assessment is required. Paragraph 5.4.29 states that it is vital that applicants consider the need for compensation as early as possible in the design process as 'retrofitting' compensatory measures will introduce delays and uncertainty to the consenting process. Applicants should also take account of any strategic plan level compensation plans in developing project level compensation plans (Paragraph 5.4.30). Applicants should include measures to mitigate the direct and indirect effects of

development on ancient woodland, ancient and veteran trees or other irreplaceable habitats during the construction and operational phases (Paragraph 5.4.32).

2.2.15 Paragraph 5.4.35 requires applicants to '*include appropriate avoidance, mitigation, compensation and enhancement measures as an integral part of the proposed development. In particular, the applicant should demonstrate that*:

- *during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works;*
- *the timing of construction has been planned to avoid or limit disturbance;*
- *during construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements;*
- *habitats will, where practicable, be restored after construction works have finished;*
- *opportunities will be taken to enhance existing habitats rather than replace them, and where practicable, create new habitats of value within the site landscaping proposals. Where habitat creation is required as mitigation, compensation, or enhancement, the location and quality will be of key importance. In this regard habitat creation should be focused on areas where the most ecological and ecosystems benefits can be realised;*
- *mitigations required as a result of legal protection of habitats or species will be complied with*'.

2.2.16 NPS EN-1 Paragraph 5.4.36 states that '*Applicants should produce and implement a Biodiversity Management strategy'*.

2.2.17 Paragraph 5.4.42 states that *'development should, in line with the mitigation hierarchy, aim to avoid significant harm to biodiversity and geological conservation interest, including through consideration of reasonable alternatives…Where significant harm cannot be avoided, impacts should be mitigated and as a last resort, appropriate compensation measures should be sought'.*

2.2.18 Paragraph 5.4.44 states that '*any habitat creation or enhancement delivered including linkages with existing habitats for compensation or biodiversity net gain should generally be maintained for a minimum period of 30 years, or for the lifetime of the project, if longer'.*

2.2.19 Paragraph 5.4.53 states that '*the Secretary of State should not grant development consent for any development that would result in the loss or deterioration of any irreplaceable habitats, including ancient woodland, and ancient and veteran trees unless there are wholly exceptional reasons and a suitable compensation strategy exists'.*

2.2.20 Paragraph 5.4.54 states that '*the Secretary of State should refuse consent where harm to a protected species and relevant habitat would result, unless there is an overriding public interest and the other relevant legal tests are met'.*

Civil and Military Aviation and Defence Interests

2.2.21 NPS EN-1 Paragraph 5.5.37 states that '*where the proposed development may affect the performance of civil or military aviation CNS, meteorological radars and/or other defence assets an assessment of potential effects should be set out in the ES*'. Any assessments should also demonstrate the cumulative effects of the project with other relevant projects in relation to aviation, meteorological and defence (Paragraph 5.5.40).

Dust, Odour, Artificial Light, Smoke, Steam and Insect Infestation

2.2.22 NPS EN-1 Paragraph 5.7.1 outlines that during construction, operation and decommissioning of energy infrastructure there is a potential for the release of a range of emissions such as odour, dust, steam, smoke, artificial light and infestation of insects. Paragraph 5.7.5 sets out a requirement for applicants to assess the above potential impacts as part of the ES and to describe measures to prevent or mitigate potential impacts (also paragraph 5.7.6). Paragraph 5.7.11 states that '*A construction management plan may help clarify and secure mitigation*'.

Flood Risk

2.2.23 NPS EN-1 Paragraph 5.8.6 states that '*The aims of planning policy on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to steer new development to areas with the lowest risk of flooding'*.

2.2.24 Paragraph 5.8.13 states that '*A site-specific flood risk assessment should be provided for all energy projects in Flood Zones 2 and 3 in England or Zones B and C in Wales. In Flood Zone 1 in England or Zone A in Wales, an assessment should accompany all proposals involving:*

- *sites of 1 hectare or more;*
- *land which has been identified by the EA or NRW as having critical drainage problems;*
- *land identified (for example in a local authority strategic flood risk assessment) as being at increased flood risk in future;*
- *land that may be subject to other sources of flooding (for example surface water); and*
- *where the EA or NRW, Lead Local Flood Authority, Internal Drainage Board or other body have indicated that there may be drainage problems'.*

2.2.25 Paragraph 5.8.14 states *'This assessment should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account'*.

Historic Environment

2.2.26 NPS EN-1 Paragraph 5.9.11 states *'Where a site on which development is proposed includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where proposed development will affect the setting of a heritage asset, representative visualisations may be necessary to explain the impact'.*

2.2.27 Paragraph 5.9.24 states '*In considering the impact of a proposed development on any heritage assets, the Secretary of State (SoS) should consider the particular nature of the significance of the heritage assets and the value that they hold for this and future generations. This understanding should be used to avoid or minimise conflict between their conservation and any aspects of the proposals'.*

2.2.28 Paragraph 5.9.30 states that '*Substantial harm to or loss of significance of assets of the*

highest significance, including Scheduled Monuments; Protected Wreck Sites; Registered Battlefields; grade I and II Listed Buildings; grade I and II* Registered Parks and Gardens; and World Heritage Sites, should be wholly exceptional'.*

2.2.29 Paragraph 5.9.36 states that '*When considering applications for development affecting the setting of a designated heritage asset, the Secretary of State should give appropriate weight to the desirability of preserving the setting such assets and treat favourably applications that preserve those elements of the setting that make a positive contribution to, or better reveal the significance of, the asset. When considering applications that do not do this, the Secretary of State should give great weight to any negative effects, when weighing them against the wider benefits of the application. The greater the negative impact on the significance of the designated heritage asset, the greater the benefits that will be needed to justify approval'.*

Landscape and Visual

2.2.30 NPS EN-1 Paragraph 5.10.4 states '*Landscape effects arise not only from the sensitivity of the landscape but also the nature and magnitude of change proposed by the development, whose specific siting and design make the assessment a case-by-case judgement'*.

2.2.31 EN-1 acknowledges at Paragraph 5.10.5 that '*virtually all nationally significant energy infrastructure projects will have adverse effects on the landscape, but there may also be beneficial landscape character impacts arising from mitigation*'. Paragraph 5.10.13 goes onto state that '*all proposed energy infrastructure is likely to have visual effects for many receptors around proposed sites'*.

2.2.32 Paragraph 5.10.7 states that '*National Parks, the Broads and AONBs have been confirmed by the government as having the highest status of protection in relation to landscape and natural beauty. Each of these designated areas has specific statutory purposes. Projects should be designed sensitively given the various siting, operational, and other relevant constraints. For development proposals located within designated landscapes the Secretary of State should be satisfied that measures which seek to further purposes of the designation are sufficient, appropriate and proportionate to the type and scale of the development'.*

2.2.33 Outside of nationally designated areas, there are local landscapes which may be highly valued locally. As stated at Paragraph 5.10.12, locally valued landscapes should not be used in themselves to refuse consent, as this may unduly restrict acceptable development.

2.2.34 It will be for the Secretary of State to judge whether the visual effects on sensitive receptors, such as local residents, and other receptors such as visitors to the local area, outweigh the benefits of the project (Paragraph 5.10.14).

2.2.35 Paragraph 5.10.16 states that '*The applicant should carry out a landscape and visual impact assessment and report it in the ES, including cumulative effects*'. Paragraph 5.10.17 adds to this stating that '*The landscape and visual assessment should include reference to any landscape character assessment and associated studies as a means of assessing landscape impacts relevant to the proposed project'.*

2.2.36 Paragraph 5.10.19 states '*The applicant should consider landscape and visual matters in the early stages of siting and design, where site choices and design principles are being established. This will allow the applicant to demonstrate in the ES how negative effects have been minimised and opportunities for creating positive benefits or enhancement have been recognised and incorporated into the design, delivery and operation of the*

scheme'.

2.2.37 In undertaking an assessment, Paragraph 5.10.20 sets out that it should include the effects on landscape components and character during construction and operation. Furthermore, for projects which may affect a National Landscape the assessment should include effects on the natural beauty and special qualities of these areas. Paragraph 5.10.21 states that *'The assessment should include the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include light pollution effects, including on dark skies, local amenity, and nature conservation'*.

2.2.38 Paragraph 5.10.22 requires assessments to address the landscape and visual effects of noise and light pollution (and other emissions) from the construction and operational activities on residential amenity and on sensitive locations, receptors and views, and how these will be minimised.

2.2.39 Paragraph 5.10.24 states that applicants should consider how landscapes can be enhanced using landscape management plans, as this will help to enhance environmental assets where they contribute to landscape and townscape quality. Paragraph 5.10.25 sets out that '*In considering visual effects it may be helpful for applicants to draw attention, in supporting evidence to their applications, to any examples of existing permitted infrastructure they are aware of with a similar magnitude of impact on equally sensitive receptors. This may assist the Secretary of State in judging the weight they should give to the assessed visual impacts of the proposed development*'.

2.2.40 Paragraph 5.10.26 states '*Reducing the scale of a project can help to mitigate the visual and landscape effects of a proposed project. However, reducing the scale or otherwise amending the design of a proposed energy infrastructure project may result in a significant operational constraint and reduction in function – for example, electricity generation output. There may, however, be exceptional circumstances, where mitigation could have a very significant benefit and warrant a small reduction in function. In these circumstances, the Secretary of State may decide that the benefits of the mitigation to reduce the landscape and/or visual effects outweigh the marginal loss of function'.*

2.2.41 Paragraph 5.10.27 outlines that '*Adverse landscape and visual effects may be minimised through appropriate siting of infrastructure within its development site and wider setting. The careful consideration of colours and materials will support the delivery of a well-designed scheme, as will sympathetic landscaping and management of its immediate surroundings'.*

2.2.42 Paragraph 5.10.35 states that '*The scale of energy projects means that they will often be visible across a very wide area. The Secretary of State should judge whether any adverse impact on the landscape would be so damaging that it is not offset by the benefits (including need) of the project''.*

Land Use, Including Open Space, Green Infrastructure and Green Belt

2.2.43 The Environmental Statement accompanying an application should identify existing and proposed land uses near the project and any effects of replacing an existing development or use of the site with the proposed project or preventing a development or use on a neighbouring site from continuing (NPS EN-1 Paragraph 5.11.8).

2.2.44 Paragraph 5.11.8 also identifies the need for applicants to ensure that risks posed by land contamination have been fully considered along with measures to address any risk.

2.2.45 The need to consult with the local community on proposals to build on existing open space, sports or recreational buildings and land is set out in Paragraph 5.11.9 which also states that taking into account the consultations, applicants should consider providing new or additional open space including green or blue infrastructure, sport or recreational facilities to substitute for any losses as a result of their proposal. Paragraph 5.11.32 states that '*The Secretary of State should not grant consent for development on existing open space, sports and recreational buildings and land unless an assessment has been undertaken either by the local authority or independently, which has shown the open space or the buildings and land to be surplus to requirements or the Secretary of State determines that the benefits of the project (including need), outweigh the potential loss of such facilities, taking into account any positive proposals made by the applicant to provide new, improved or compensatory land or facilities'*.

2.2.46 Applicants should seek to minimise impacts on the best and most versatile agricultural land and preferably use land in areas of poorer quality and should seek to minimise impacts on soil health (Paragraphs 5.11.12 and 5.11.13).

2.2.47 In considering impacts on mineral resources, Paragraph 5.11.19 states that '*Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place'.*

2.2.48 Paragraph 5.11.20 highlights the presumption against inappropriate development within the Green Belt and the need for applicants to determine whether their proposal, or part of it, is inappropriate development within the meaning of Green Belt policy. However, Paragraph 5.11.22 goes on to state that '*Moreover an applicant may be able to demonstrate that particular energy infrastructure, such as an underground pipeline, may be considered an "engineering operation" and regarded as not inappropriate in Green Belt. This is provided it preserves the openness of the Green Belt and does not conflict with the purpose of Green Belt designation. It may also be possible for an applicant to show that the physical characteristics of a proposed overhead line in a particular location would not have so harmful an impact as to conflict with the purposes of Green Belt designation, or with other protections of rural landscape'.*

2.2.49 Paragraph 5.11.27 states that '*Existing trees and woodlands should be retained wherever possible. In the EIP [Environmental Improvement Plan], the Government committed to increase the tree canopy and woodland cover to 16.5% of total land area of England by 2050. The applicant should assess the impacts on, and loss of, all trees and woodlands within the project boundary and develop mitigation measures to minimise adverse impacts and any risk of net deforestation as a result of the scheme…….Where woodland loss is unavoidable, compensation schemes will be required, and the long-term management and maintenance of newly planted trees should be secured'*.

2.2.50 Paragraph 5.11.29 sets out that where a project sterilises the use of land (for example in some cases under transmission lines '*there may be scope for this to be mitigated through, for example, using or incorporating the land for nature conservation or wildlife corridors or for parking and storage in employment areas'.*

2.2.51 NPS EN-1 Paragraph 5.11.30 states that 'Public rights of way, National Trails and other rights of access to land are important recreational facilities for example for walkers, cyclists and horse riders. The Secretary of State should expect applicants to take appropriate mitigation measures to address adverse effects on….National Trails, other rights of way and open access land, where appropriate, to consider what opportunities there may be to improve or create new access. In considering revisions to an existing right of way, consideration should be given to the use, character, attractiveness, and convenience of the right of way'. Paragraph 5.11.37 sets out the need for the Secretary

of State to ensure that substantial weight is given to any harm to the Green Belt, while taking account, in relation to renewable and linear infrastructure, of the extent to which its physical characteristics are such that it has limited or no impact on the fundamental purposes of Green Belt designation.

Noise and Vibration

2.2.52 NPS EN-1 Paragraph 5.12.1 states '*Excessive noise can have wide-ranging impacts on the quality of human life and health such as annoyance, sleep disturbance, cardiovascular disease and mental ill-health. It can also have an impact on the environment and the use and enjoyment of areas of value such as quiet places and areas with high landscape quality'*.

2.2.53 NPS EN-1 Paragraph 5.12.5 lists the factors that will '*determine the likely noise impact of a proposed development include:*

- *the inherent operational noise from the proposed development, and its characteristics;*
- *the proximity of the proposed development to noise sensitive premises (including residential properties, schools and hospitals) and noise sensitive areas (including certain parks and open spaces;*
- *the proximity of the proposed development to quiet places and other areas that are particularly valued for their soundscape or landscape quality;*
- *the proximity of the proposed development to sites where noise may have an adverse impact on protected species or other wildlife, including migratory species; and*
- *the potential presence of unexploded ordnance on the seabed*'.

2.2.54 Paragraph 5.12.6 states '*Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment*:

- *a description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal characteristics, if the noise is impulsive, whether the noise contains particular high or low frequency content or any temporal characteristics of the noise;*
- *identification of noise sensitive receptors and noise sensitive areas that may be affected;*
- *the characteristics of the existing noise environment;*
- *a prediction of how the noise environment will change with the proposed development;*
    i. *in the shorter term, such as during the construction period;*
    ii. *in the longer term, during the operating life of the infrastructure; and*
    iii. *at particular times of the day, evening and night (and weekends) as appropriate, and at different times of year.*
- *an assessment of the effect of predicted changes in the noise environment on any noise-sensitive receptors, including an assessment of any likely impact on health and quality of life / well-being where appropriate, particularly among those*

disadvantaged by other factors who are often disproportionately affected by noise-sensitive areas;

- *if likely to cause disturbance, an assessment of the effect of underwater or subterranean noise; and*
- *all reasonable steps taken to mitigate and minimise potential adverse effects on health and quality of life'*.

2.2.55 Paragraph 5.12.13 states that the Secretary of State should consider whether mitigation measures are needed both for operational and construction noise over and above any which may form part of the project mitigation. Paragraph 5.12.14 identifies potential mitigation measures:

- '*Engineering: reducing the noise generated at source and/or containing the noise generated;*
- *Lay-out: where possible, optimising the distance between the source and noise sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose built barriers, or other buildings;*
- *Administrative: using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise limits/noise levels, differentiating as appropriate between different times of day, such as evenings and late at night, and taking into account seasonality of wildlife in nearby designated sites; and*
- *Insulation: mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building'.*

2.2.56 At Paragraph 5.12.16, NPS EN-1 outlines the need to have due regard to the relevant sections of the Noise Policy Statement for England, the NPPF, and the government's associated planning guidance on noise.

Socio-Economic Impacts

2.2.57 Where a project is likely to have socio-economic impacts at local or regional levels, NPS EN-1 Paragraph 5.13.2 requires the applicant to undertake and include in their application an assessment of these impacts as part of the ES.

2.2.58 Paragraph 5.13.5 states that '*Applicants should describe the existing socio-economic conditions in the areas surrounding the proposed development and should also refer to how the development's socio-economic impacts correlate with local planning policies'*.

2.2.59 Where appropriate, applicants should consider developing accommodation strategies, especially during the construction and decommissioning stages (Paragraph 5.13.7).

2.2.60 Paragraph 5.13.9 states that *'The Secretary of State should have regard to the potential socio-economic impacts of new energy infrastructure identified by the applicant and from any other sources that the Secretary of State considers to be both relevant and important to its decision'.*

2.2.61 Paragraph 5.13.10 states that '*The Secretary of State may conclude that limited weight is to be given to assertions of socio-economic impacts that are not supported by evidence (particularly in view of the need for energy infrastructure as set out in this NPS)'.*

2.2.62 Paragraph 5.13.11 states that '*The Secretary of State should consider any relevant positive provisions the applicant has made or is proposing to make to mitigate impacts*

(for example through planning obligations) and any legacy benefits that may arise as well as any options for phasing development in relation to the socio-economic impacts'.

Traffic and Transport

2.2.63 NPS EN-1 Paragraph 5.14.1 states '*The transport of materials, goods and personnel to and from a development during all project phases can have a variety of impacts on the surrounding transport infrastructure and potentially on connecting transport networks, for example through increased congestion. Impacts may include economic, social and environmental effects'*.

2.2.64 Paragraph 5.14.11 requires that '*Where mitigation is needed, possible demand management measures must be considered. This could include identifying opportunities to:*

- *reduce the need to travel by consolidating trips;*
- *locate development in areas already accessible by active travel and public transport;*
- *provide opportunities for shared mobility;*
- *re-mode by shifting travel to a sustainable mode that is more beneficial to the network;*
- *retime travel outside of the known peak times;*
- *reroute to use parts of the network that are less busy'*.

2.2.65 Paragraph 5.14.4 states that '*The consideration and mitigation of transport impacts is an essential part of Government's wider policy objectives for sustainable development as set out in Section 2.6 of this NPS'*.

2.2.66 Paragraph 5.14.19 states '*Where the proposed mitigation measures are insufficient to reduce the impact on the transport infrastructure to acceptable levels, the Secretary of State should consider requirements to mitigate adverse impacts on transport networks arising from the development'.*

2.2.67 Paragraph 5.14.20 states '*Development consent should not be withheld provided that the applicant is willing to enter into planning obligations for funding new infrastructure or requirements can be imposed to mitigate transport impacts'.*

2.2.68 Paragraph 5.14.21 states '*The Secretary of State should only consider refusing development on highways grounds if there would be an unacceptable impact on highway safety, residual cumulative impacts on the road network would be severe, or it does not show how consideration has been given to the provision of adequate active public or shared transport access and provision'.*

Resource and Waste Management

2.2.69 NPS EN-1 Paragraph 5.15.4 states that '*All large infrastructure projects are likely to generate some hazardous and non-hazardous waste. The EA's Environmental Permit regime incorporates operational waste management requirements for certain activities'*.

2.2.70 Paragraph 5.15.8 states that '*The applicant should set out the arrangements that are proposed for managing any waste produced and prepare a report that sets out the sustainable management of waste and use of resources throughout any relevant demolition, excavation and construction activities'.*

2.2.71 Paragraph 5.15.9 states '*They should also include an assessment of the impact of the waste arising from development on the capacity of waste management facilities to deal with other waste arising in the area for at least five years of operation'.*

2.2.72 Paragraph 5.15.16 states that '*Where necessary, the Secretary of State should use requirements or obligations to ensure that appropriate measures for waste management are applied'.*

Water Quality and Resources

2.2.73 NPS EN-1 Paragraph 5.16.1 states that '*Infrastructure development can have adverse effects on the water environment, including groundwater, inland surface water, transitional waters, coastal and marine waters'*.

2.2.74 Paragraph 5.16.3 states '*Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment, as part of the ES or equivalent*'**.**

2.2.75 Paragraph 5.16.9 states '*The risk of impacts on the water environment can be reduced through careful design to facilitate adherence to good pollution control practice. For example, designated areas for storage and unloading, with appropriate drainage facilities, should be clearly marked'.*

2.2.76 Paragraph 5.16.14 states '*The Secretary of State must refuse development consent where a project is likely to cause deterioration of a water body or its failure to achieve good status or good potential, unless the requirements set out in Regulation 19 are met'.*

3 National Policy Statement for Electricity Networks Infrastructure (EN-5)

3.1.1 NPS EN-5 is additional to NPS EN-1. Applicants and the Secretary of State should consider both NPS EN-1 and NPS EN-5 together. EN-5 contains additional policy guidance on:

- Factors influencing site selection and design;
- Biodiversity and geological conservation;
- Landscape and visual;
- Noise and vibration;
- Electric and Magnetic Fields; and
- Sulphur Hexafluoride.

Factors influencing site selection and design

3.1.2 Paragraph 2.2.1 of NPS EN-5 sets out that '*The Secretary of State should bear in mind that the initiating and terminating points – or development zone – of new electricity networks infrastructure is not substantially within the control of the applicant*'.

3.1.3 Paragraph 2.2.2 outlines that siting is determined by:

- '*The location of new generation stations or other infrastructure requiring connection to the network, and/or*
- *System capacity and resilience requirements determined by the Electricity System Operator*'.

3.1.4 Paragraph 2.2.3 identifies that *'These twin constraints, coupled with the government's legislative commitment to net zero by 2050, strategic commitment to new interconnectors with neighbouring North Sea countries and an ambition of up to 50GW of offshore wind generation by 2030, means that very significant amounts of new electricity networks infrastructure is required, including in areas with comparatively little build-out to date'*.

3.1.5 Paragraph 2.2.6 outlines that the above locational constraints do not exempt applicants from their duty to consider and balance the site-selection considerations set out in EN-5.

3.1.6 Paragraph 2.2.7 states that the connection between the initiating and terminating points of a proposed new electricity line will often '*not be via the most direct route. Siting constraints, such as engineering, environmental or community considerations will be important in determining a feasible route'.* With regard to the siting of substations, paragraph 2.2.8 does identify that there is '*usually a degree of flexibility in the location of the development's associated substations, and applicants should consider carefully their location, as well as their design'.*

3.1.7 Paragraph 2.2.10 refers to the duties under Section 9 of the Electricity Act 1989 to develop and maintain an economical and efficient network and also the duty under Schedule 9 of the Electricity Act 1989 on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to '*have regard to the*

desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and …..do what [they] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or any such flora, fauna, features, sites, buildings or objects'.

Climate change adaptation and resilience

3.1.8 Paragraph 2.3.2 of NPS EN-5 identifies the increased risk to the resilience of infrastructure as a result of climate change. Applicants should set out to what extent the proposed development is expected to be vulnerable to, and, as appropriate, resilient to:

- Flooding, particularly for substations;
- Effects of wind and storms on overhead lines;
- Higher average temperatures leading to increased transmission losses;
- Earth movement or subsidence caused by flooding or drought; and
- Coastal erosion.

Consideration of Good Design for Energy Infrastructure

3.1.9 NPS EN-5 paragraph 2.4.3 states that '*The Secretary of State should bear in mind that electricity networks infrastructure must in the first instance be safe and secure, and that the functional design constraints of safety and security may limit an applicant's ability to influence the aesthetic appearance of that infrastructure'*.

3.1.10 Paragraph 2.4.4 states '*While the above principles should govern the design of an electricity networks infrastructure application to the fullest possible extent – including in its avoidance and/or mitigation of potential adverse impacts (particularly those detailed in Sections 2.9 below) – the functional performance of the infrastructure in respect of security of supply and public and occupational safety must not thereby be threatened'.*

Environmental and Biodiversity Net Gain

3.1.11 Paragraph 2.5.1 of NPS EN-5 sets out that '*When planning and evaluating the proposed development's contribution to environmental and biodiversity net gain, it will be important – for both the applicant and the Secretary of State - to supplement the generic guidance set out in EN-1 (Section 4.6) with recognition that the linear nature of electricity networks infrastructure can allow for excellent opportunities to*:

- *Reconnect important habitats via green corridors, biodiversity stepping zones, and reestablishment of appropriate hedgerows; and/or*
- *Connect people to the environment, for instance via footpaths and cycleways constructed in tandem with environmental enhancements'*.

Land Rights and Land Interests

3.1.12 NPS EN-5 paragraph 2.6.1 states that in order to lawfully install, inspect, maintain, repair, adjust, alter, replace or remove an electricity line (above or below ground) its related equipment and associated mitigation or enhancement schemes, applicants must:

- '*Own the land on, over, or under which the relevant activity is to take place; or*

- *Hold sufficient rights over or interests in that land (typically in the from of an easement); or*
- *Have permission for the activity from the present owner or occupier of that land (typically in the form of a wayleave)'*.

3.1.13 Where the applicant does not own or wish to own the land in question, Paragraph 2.6.2 sets out that, '*it should try to reach a voluntary agreement giving it sufficient rights and/or permissions to undertake the relevant work'.* Paragraph 2.6.3 goes on to state that as a last resort*, 'the network company may, as part of its application to the Secretary of State, seek to acquire rights compulsorily over the land in question by means of a provision in the DCO'*. The applicant may also seek the compulsory acquisition of land for example for networks infrastructure such as new substations, and for provision for mitigation, landscape enhancement and biodiversity net gain (paragraphs 2.6.5 and 2.6.6).

Holistic Planning

3.1.14 EN-1 explains in Section 4.10 that the Planning Act 2008 aims to create a holistic planning regime, such that the cumulative effects of the same project can be considered together. Paragraph 2.7.2 of NPS EN-5 sets out that '*the government envisages that, wherever reasonably possible, applications for new generating stations and their related infrastructure should be contained in a single application to the Secretary of State'. But goes onto note that '…a consolidated approach of this kind may not always be possible, nor represent the most efficient strategy for delivery of new infrastructure'*. Paragraph 2.7.3 explains that this could be '*… due to the differing lengths of time needed to prepare the applications for submission to the Secretary of State, or because a network application relates to multiple generation projects (which could be onshore or offshore), or because the works involved are strategic reinforcements required for a number of reasons*'.

Strategic Network Planning

3.1.15 NPS EN-5 sets out the benefits of strategic network planning. Paragraph 2.8.1 states that '*A more strategic approach to network planning will ensure that network development keeps pace with renewable generation and anticipates future system needs. Strategic network planning, such as through the Holistic Network Design and its follow up exercises or through forthcoming Centralised Strategic Network plans, helps reduce the overall impact of infrastructure by identifying opportunities for coordination, where appropriate, and taking a holistic view of both the onshore and offshore network'.*

3.1.16 Paragraph 2.8.3 goes onto explain that *'where the application is a reinforcement project in its own right and does not accompany an application for a generating station, or is not underpinned by a contractually-supported agreement to provide an as-yet-unconsented generating station with a connection), the Secretary of State should have regard to the need case for new electricity networks infrastructure set out in Section 3.3 of EN-1'.*

Applicants Assessment

Biodiversity and Geological Conservation

Impacts

3.1.17 NPS EN-5 Section 2.9 (Applicant assessment) states at Paragraph 2.9.3 that '*electricity networks infrastructure pose a particular risk to birdlife including large birds, such as swans and geese, and perching birds' and Paragraph 2.9.4 advises that 'applicants*

should consider measures to make lines more visible such as bird flappers and diverters'.

3.1.18 NPS EN-5 Paragraph 2.9.6 states that '*particular consideration should be given to feeding and hunting grounds, migration corridors and breeding grounds, where they are functionally linked to sites designated or allocated under the 'national site network' provisions of the Conservation of Habitats and Species Regulations'*.

Mitigation

3.1.19 NPS EN-5 Paragraph 2.10.2 to 2.10.4 relating to mitigation state that

- *'careful siting of a line away from, or parallel to, but not across, known flight paths can reduce the numbers of birds colliding with overhead lines considerably'.*
- *Making lines more visible by methods such as the fitting of bird flappers and diverters to the earth wire, which swivel in the wind, glow in the dark and use fluorescent colours designed specifically for bird vision can also reduce the number of deaths. The design and colour of the diverters will be specific to the conditions – the line and pylon/transmission tower specifications and the species at risk.*
- *Electrocution risks can be reduced through the design of lattice steel tower crossarms, insulators and the construction of other parts of high voltage power lines so that birds find no opportunity to perch near energised power lines on which they might electrocute themselves'.*

Landscape and Visual Impact

Impacts

3.1.20 NPS EN-5 outlines the Government's view that the development of overhead lines is not incompatible in principle with an applicants' statutory duty under Schedule 9 to the Electricity Act 1989 to have regard to visual and landscape amenity and to reasonably mitigate possible impacts. As stated at Paragraph 2.9.7, '*While the government does not believe that the development of overhead lines is incompatible in principle with applicants' statutory duty under Schedule 9 of the Electricity Act 1989, to have regard to visual and landscape amenity and to reasonably mitigate possible impacts thereon, in practice new overhead lines can give rise to adverse landscape and visual impacts'*. Paragraph 2.9.12 goes on to state that '*in nationally designated landscapes (for instance, National Parks, The Broads and Areas of Outstanding Natural Beauty) even residual impacts may well make an overhead line proposal unacceptable in planning terms'*. Paragraph 2.9.14 provides that '*Where the nature or proposed route of an overhead line will likely result in particularly significant landscape and visual impacts, as would be assessed through landscape, seascape and visual impact assessment, the applicant should demonstrate that they have given due consideration to the costs and benefits of feasible alternatives to the overhead line. This could include – where appropriate – rerouting, underground or subsea cables and the feasibility e.g. in cost, engineering or environmental terms of these*'.

3.1.21 Paragraph 2.9.15 states that '*The ES should set out details of this consideration, including the applicant's rationale for eschewing feasible alternatives to the overhead line, and the mitigation cost-calculation methodology that this rationale may rely upon'.*

3.1.22 Paragraph 2.9.16 states '*The Holford Rules – guidelines for the routing of new overhead lines – were originally set out in 1959. These guidelines, intended as a common-sense approach to overhead line route design, were reviewed and updated by the industry in the 1990s, and they should be embodied in the applicants' proposals for new overhead lines'.* Paragraph 2.9.18 introduces the Horlock Rules – guidelines for the design and

siting of substations which were established by National Grid in 2009 in pursuance of its duties under Schedule 9 to the Electricity Act 1989 and states that these principles should be embodied in applicants' proposals for the infrastructure associated with new overhead lines.

3.1.23 Paragraph 2.9.20 states '*Although it is the government's position that overhead lines should be the strong starting presumption for electricity networks developments in general, this presumption is reversed when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Area of Outstanding Natural Beauty)'*. Paragraph 2.9.21 states '*In these areas, and where harm to the landscape, visual amenity and natural beauty of these areas cannot feasibly be avoided by rerouting overhead lines, the strong starting presumption will be that the applicant should underground the relevant section of the line'*.

3.1.24 The potential impact of undergrounding is referenced in Paragraph 2.9.22 '…*undergrounding will not be required where it is infeasible in engineering terms, or where the harm that it causes is not outweighed by its corresponding landscape, visual, amenity and natural beauty benefits'*. Paragraph 2.9.23 states that '*cases will arise where – though no part of the proposed development crosses a designated landscape – a high potential for widespread and significant adverse landscape and/or visual impacts along certain sections of its route may result in recommendations to use undergrounding for relevant segments of the line or alternatively consideration of using a route including subsea cabling'.*

3.1.25 Paragraph 2.9.25 outlines the Secretary of State decision making setting out that the Secretary of State should only grant development consent for underground or subsea sections of a proposed line over an overhead line alternative if '*they are satisfied that the benefits accruing from the former proposal clearly outweigh any extra economic, social, or environmental impacts that it presents, the mitigation hierarchy has been followed, and that any technical obstacles associated with it are surmountable'.*

Mitigation

3.1.26 Paragraph 2.10.5 identifies that '*In addition to good design in accordance with the Holford and Horlock rules and the consideration of undergrounding or rerouting the line where possible, the principal opportunities for mitigating adverse landscape and visual impacts of electricity networks infrastructure are*:

- *Consideration of network reinforcement options (where alternatives exist) which may allow improvements and/or extensions to an existing line rather than the building of an entirely new line;*
- *Selection of the most suitable type and design of support structure in order to minimise the overall visual impact on the landscape. In particular, ensuring that towers are of the smallest possible footprint and internal volume; and*
- *The rationalisation, reconfiguration and/or undergrounding of existing electricity networks infrastructure in the vicinity of the proposed development'*.

3.1.27 In addition, there are specific measures that might be taken and which the Secretary of State could mandate through DCO requirements if appropriate. Paragraph 2.10.6 includes the examples of landscape schemes comprising off-site tree and hedgerow planting or provision of screening. Where such mitigation is required, Paragraph 2.10.7 sets out that rights over land necessary for such measures may be compulsorily acquired as part of the DCO.

Noise and Vibration

Impacts

3.1.28 NPS EN-5 Paragraph 2.9.26 acknowledges that '*All high voltage transmission lines have the potential to generate noise under certain conditions'*. Paragraphs 2.9.27 to 2.9.36 detail factors relating to noise from high voltage transmission lines.

3.1.29 Paragraph 2.9.39 states that '*For the assessment of noise from substations, standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory'.*

3.1.30 Paragraph 2.9.40 states '*For the assessment of noise from overhead lines, the applicant must use an appropriate method to determine the sound level produced by the line in both dry and wet weather conditions, in addition to assessing the impact on noise-sensitive receptors'*.

Mitigation

3.1.31 NPS EN-5 Paragraph 2.10.9 states that '*Applicants must consider the following measures:*

- *The positioning of lines to help mitigate noise*
- *Ensuring that the appropriately sized conductor arrangement is used to minimise potential noise*
- *Quality assurance through manufacturing and transportation to avoid damage to overhead line conductors which can increase potential noise effect*
- *Ensuring that conductors are kept clean and free of surface contaminants during stringing / installation*
- *The selection of quieter cost-effective plants'*.

3.1.32 In addition, Paragraph 2.10.10 sets out that '*the ES should include information on planned maintenance arrangements. Where detail is not included, the Secretary of State should consider stipulating appropriate maintenance arrangements by way of requirements attached to any grant of development consent'*.

Electric and Magnetic Fields (EMF)

Impacts

3.1.33 Paragraph 2.9.44 of NPS EN-5 states that '*Power frequency EMFs arise from generation, transmission, distribution and use of electricity and will occur around power lines and electric cables and around domestic, office or industrial equipment that uses electricity*'. Paragraph 2.9.46 states that all overhead power lines produce EMFs. As stated in Paragraph 2.9.55 Government policy is that exposure of the public should comply with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998 guidelines. Applicants are expected to show evidence of this compliance.

Mitigation

3.1.34 In considering mitigation measures, Paragraph 2.10.11 states that '*The applicant should consider the following factors:*

- *height, position, insulation and protection (electrical or mechanical as appropriate) measures subject to ensuring compliance with the Electricity Safety, Quality and Continuity Regulations 2002;*
- *that optimal phasing of high voltage overhead power lines is introduced wherever possible and practicable in accordance with the Code of Practice to minimise EMFs; and*

- *any new advice emerging from the Department of Health and Social Care relating to government policy for EMF exposure guidelines'.*

3.1.35 Paragraph 2.10.12 sets out that '*where it can be shown that the line will comply with the current public exposure guidelines and the policy on phasing no further mitigation should be necessary'*.

Sulphur Hexafluoride

Impacts

3.1.36 Sulphur Hexafluoride (SF6) is an insulating and arc-suppressant gas used in high-voltage switchgear for electricity networks. It is also a potent greenhouse gas. As a result, Paragraph 2.9.61 of EN-5 sets out that careful consideration should be given in the design stage to whether a proposed development could be reconceived to avoid the use of SF-6 reliant assets.

Mitigation

3.1.37 Paragraphs 2.10.14 sets out that '*The climate-warming potential of SF6 is such that applicants should, as a rule, avoid the use of SF6 in new developments' and paragraph 2.10.13 goes onto state that 'Where no proven SF6-free alternative is commercially available, and where the cost of procuring a bespoke alternative is grossly disproportionate, the continued use of SF6 is acceptable, provided that emissions monitoring and control measures compliant with the F-gas Regulation and/or its successors are in place'* and 2.10.15 set out that applicants, as a rule should avoid the use of SF6 in new developments, unless there is no SF6-free alternative is commercially available, and where the cost of producing a bespoke alternative is grossly disproportionate.

Special Assessment Principles for offshore-onshore transmission

3.1.38 Paragraphs 2.12.1 to 2.12.6 (inclusive) set out that the scale of offshore transmission infrastructure required to support the ambition of 50GW of offshore wind has significant implications for the onshore network. Paragraph 2.12.4 states that as identified in NPS EN-1 it is important that the network planning for offshore transmission is much more closely co-ordinated with the planning and development of the onshore transmission network than previously.

3.1.39 Paragraph 2.12.6 states that '*a more co-ordinated approach to designing offshore transmission is expected to be adopted compared with the previous standard approach of radial routes to shore. This applies to spatially close groups of offshore windfarms, subsea 'onshore' transmission or bootstraps, interconnectors and multi-purpose interconnectors*'.

Applicant Assessment: Consideration of Strategic Network Design

3.1.40 As stated in Paragraph 2.13.1 the strategic network designs will usually form the basis for identifying proposals for co-ordinated transmission. This includes the Holistic Network Design (HND) for offshore-onshore transmission. Paragraph 2.13.3 outlines how the work of the HND and its subsequent follow up exercises considered the objectives for designs to be economic and efficient, deliverable and operable, minimise impact on the environment and minimise the impact on the local communities.

3.1.41 Paragraph 2.13.7 states that '*On occasion, network designs may be amended as necessary as a result of new information or other changes (such as where a project within a coordinated design is no longer being progressed)'* and Paragraph 2.13.8 goes onto state that '*Any such changes approved through an appropriate change control process are likely to result in information that is important and relevant consideration*'.

Applicant Assessment: Coordinated approach, including for Early Opportunities' projects with firm connection agreements prior to the Holistic Network Design

3.1.42 Paragraph 2.13.9 outlines that radial offshore transmission options to single windfarms should only be proposed where options assessment work identifies that a coordinated solution is not feasible. Applicants bringing forward offshore transmission projects are expected to consider future demand when considering the location and route of their proposals.

4 National Policy Statement for Renewable Energy Infrastructure (EN-3)

4.1.1 In deciding an application for development consent Section 104 of the Planning Act 2008 requires the Secretary of State to determine the application in accordance with any relevant National Policy Statement (NPS). The NPSs relevant to this project are the Overarching National Policy Statement for Energy (EN-1) and the National Policy Statement for Electricity Networks Infrastructure (EN-5) which came into force in January 2024.

4.1.2 The National Policy Statement for Renewable Energy (EN-3 2024) also includes support for the onshore infrastructure required to deliver new offshore wind developments.

4.1.3 Section 2.8 deals with offshore wind. Paragraph 2.8.1 states that '*As set out in the British Energy Security Strategy, the Government expects that offshore wind …. Will play a significant role in meeting demand and decarbonising the energy system. The ambition is to deploy up to 50GW of offshore wind capacity (including up to 5GW floating wind) by 2030, with an expectation that there will be a need for substantially more installed offshore capacity beyond this to achieve net zero carbon emissions by 2050'.*

4.1.4 Paragraphs 2.8.34 to 2.8.43 (inclusive) reiterate the position set out in NPS EN-1 and NPS EN-5 that a co-ordinated approach to onshore-offshore transmission is required. Paragraph 2.8.35 states that '*The previous standard approach to offshore-onshore connection involved a radial connection between single wind farm projects and the shore. A coordinated approach will involve the connection of multiple, spatially close, offshore wind farms and other offshore infrastructure, wherever possible, as relevant to onshore networks'.*

4.1.5 The NPS also includes references to CNP Infrastructure outlining that the assessment principles outlined in Section 4 of NPS EN-1 continue to apply to this. Applicants must show how any likely significant negative effects would be avoided, reduced, mitigated or compensated for, following the mitigation hierarchy. Early application of the mitigation hierarchy is strongly encouraged, as is engagement with key stakeholders including SNCBs, both before and at the formal pre-application stage.

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com

Norwich to Tilbury

Design Development Report:

Appendix B – External Schemes and Studies

April 2024

nationalgrid

Contents

1 External Schemes and Studies

1.1 Purpose of this Appendix

1.1.1 Since the 2023 non-statutory consultation, there have been updates to Government schemes and a number of documents have been published by external bodies which are or maybe relevant to the Norwich to Tilbury proposals.

1.1.2 As the strategic options process does not directly assess these, and in response to feedback from the public and stakeholders, this Appendix provides a commentary on the following:

- the Offshore Transmission Network Review;
- the Offshore Coordination Support Scheme
- the East Anglia Transmission Network Reinforcement Report by Hiorns Smart Energy Networks[1] (2023); and
- the Electricity System Operator East Anglia Network Study[2] (March 2024).

1.2 Offshore Transmission Network Review

1.2.1 The government launched the offshore transmission network review (OTNR) in 2020. to ensure that the transmission connections for offshore wind generation are delivered in the most appropriate way, and to find the appropriate balance between environmental, social and economic costs.

1.2.2 The review brought together key stakeholders involved in the timing, siting, design and delivery of offshore wind, to consider all aspects of the existing regime and how this influences the design and delivery of transmission infrastructure.

"This review looked into the way that the offshore transmission network is designed and delivered. It concluded in May 2023, and the organisations involved, including the Department for Energy Security and Net Zero, are now implementing its findings to deliver a coordinated offshore transmission regime for Great Britain"[3].

1.3 Offshore Coordination Support Scheme

1.3.1 In April 2022 the Government announced the Offshore Coordination Support Scheme (OCSS). The OCSS provided grant funding to projects that are further developed than those eligible for the Holistic Network Design (HND) to explore potential coordination options for offshore transmission infrastructure.

1.3.2 At that stage five projects, including the North Falls and Five Estuaries offshore wind farms, National Grid Electricity Transmission's Sea Link, and National Grid Ventures' EuroLink and Nautilus committed to exploring coordinated network designs.

[1] https://www.nationalgrideso.com/document/286066/download
[2] https://www.nationalgrideso.com/document/304496/download
[3] https://www.gov.uk/government/groups/offshore-transmission-network-review

1.3.3 Applications to the OCSS closed on 28 February 2023. In December 2024 the Government announced that a consortium of North Falls, Five Estuaries and Sea Link was successful in receiving grant funding. '*This consortium will use funding from the OCSS to explore coordination between 2 offshore wind farms and a bootstrap reinforcement to the GB grid'*[4].

1.3.4 If there is a change to the customer connections at the EACN as a result of the OCSS, there would still be requirement to reinforce the transmission system boundaries in East Anglia which will be kept under review.

1.4 East Anglia Transmission Network Reinforcement (Hiorns Smart Energy Networks (September 2023))

1.4.1 In 2023 Essex, Suffolk, and Norfolk County Council jointly commissioned and published an independent report into the Norwich to Tilbury project (the Hiorns Report). The report was a "*Review of National Grid Energy Transmission (NGET) proposals for East Anglia Network reinforcement with a focus on the need and timing of the proposed 400 kilovolt (kV) line from Norwich to Bramford to Tilbury 400 kV substations*".

1.4.2 The report reviewed:

- The need and timing for additional capacity out of the East Anglia region against the Electricity System Operators (ESO) Contracted Generation
- The need against a range of credible Generation Scenarios to assess the robustness of the need case.

1.4.3 In summary[5] the report concluded that:

"*The analysis undertaken in this report concurs with National Grid Electricity Transmission conclusion that if all the Generation which is presently contracted proceeds in accordance with its contracted dates, then there is a requirement for additional transmission capacity identified above. The proposed solutions provide the most economical solution in meeting these needs*".

"However, the need for Norwich to Bramford to Tilbury OHL has been demonstrated against the Contracted Generation. The ESO have noted that 70% of Generation projects listed in the Generation Contracted may never be built and it should also be noted that many of the projects which are eventually built come online later than their contracted dates. In looking at a range of more credible scenarios there is significant uncertainty with regard both the required volume of additional transmission capacity and timing when all this additional transmission capacity will be required"

1.4.4 It goes on:

"*The analysis undertaken in this report concludes that the need for the Norwich-Bramford-Tilbury overhead line can be deferred by 5 years. Whilst the proposed new overhead lines (OHL) may ultimately be the optimum solution to meet the future needs, given the level of uncertainty associated with the Contracted Generation background it too early to conclude it represents the best overall solution in meeting future system needs*".

[4] https://www.gov.uk/government/publications/offshore-coordination-support-scheme/ocss-funding-award-update-5-december-2023

[5] Executive Summary Paragraphs 1.2 – 1.8 of the East Anglia Transmission Network Reinforcement (Hiorns Smart Energy Networks (September 2023))

"*Given the uncertainty with respect to both volume and timing of future generation along with the timely development of the Bramford - Twinstead Tee and the Sizewell to Richborough HVDC link it provides the opportunity to pause development of the Norwich to Bramford to Tilbury until future Generation requirements crystallized and for the need case to be reviewed against the proposals outlined in Great Britain (GB) connection reform*".

"*This approach would not impact on the development of the offshore wind Generation projects which are required to meet the Net Zero challenge given the additional capacity provided by the development of the Bramford – Twinstead Tee and the HVDC link between Sizewell and Richborough along with ESO Connection reform which would ensure equitable release of available transmission capacity*".

1.4.5 The report supports National Grid's position that there is a need for additional electricity transmission capacity to facilitate renewable and low carbon energy generation development in the East Anglia region. It did not support National Grid's programme delivery date of 2030 and argued that that the need for additional transmission capacity would more likely be closer to 2035 and that National Grid could delay progressing the Project for at least five years.

1.4.6 National Grid have carefully reviewed the report and its appraisals, and we note that the report is a significant and independent study of our proposals. We welcome the report's support of the need for improvements to the transmission network and recognition that an offshore solution would result in significantly higher costs and provide lower capacity than the Norwich to Tilbury onshore proposals.

1.4.7 National Grid do not however accept the report's conclusions around the timing of need for additional capacity being closer to 2035 than 2030. National Grid is legally obliged (under our Transmission Owner Licence) to provide capacity at the dates formally agreed in contracts with energy generators (or customers). Contract dates are set out by ESO independent of National Grid.

1.4.8 Backchecks have been undertaken to ensure the capacity required in the contracts is consistent with our understanding of need (see our Strategic Options Backcheck Report 2024 for details). These backchecks also review the progress energy generators are making with planning consents for their projects.

1.4.9 At the time of writing there is a significant pipeline of energy generation schemes connecting in East Anglia after 2026 including several that have already been granted development consent and are committing to contracts with their suppliers.

1.4.10 A fuller response to the Hiorns Smart Energy Networks Report (titled April 2024 NGET Response to '*East Anglia Transmission Network Reinforcement Report by Hiorns Smart Energy Network)'* has been published on the Project website.

1.5 East Anglia Network Study (Electricity System Operator (March 2024))

1.5.1 The Electricity System Operator (ESO)[6] facilitates several roles on behalf of the electricity industry, including making formal offers to applicants requesting connection to the NETS. The ESO also manages shortfalls in capacity by reducing power flows and constraining generation. This is achieved by paying generators to reduce their outputs,

6 The Electricity System Operator (ESO) is a separate legal entity to NGET, but as of Spring 2024 was still part of the National Grid Group. During 2024 it will transition into the Independent System Operator and Planner, a new organisation which will be owned by Government and wholly independent of NGET

known as ‘constraint costs’ (i.e. payments).

1.5.2 In an Open Letter[7] to the stakeholders in the East Anglia Study in August 2023 the ESO set out that:

“The ESO is writing to provide communities with an update on our study into electricity network infrastructure in East Anglia.

This study will begin shortly, after a government decision on funding the continued development of offshore coordination between certain offshore wind farms and interconnectors is made. This is because any new offshore coordination may change the underlying needs case for planned onshore electricity network infrastructure in the region.

We will independently assess the different ways the electricity being generated can be transported, once it has landed, to where it is needed. Central to this is ensuring there are opportunities for local representatives to input their views. We are planning on hosting a series of discussions across the region to (1) allow the ESO to provide more information on our assessment; and (2) allow for attendees to provide the views and thoughts of those they represent”.

1.5.3 It went on:

“*The study into electricity network infrastructure in East Anglia that the ESO will shortly be conducting will be taken into consideration by National Grid Electricity Transmission (NGET, the Transmission Owner) when deciding how best to deliver the required reinforcement and increased transmission capacity in the region*”.

1.5.4 In March 2024 the ESO issued its East Anglia Network Study.

1.5.5 National Grid welcomes the independent assessment which the Electricity System Operator (ESO) has delivered, to consider the consequential infrastructure impacts should the Government decide to take the OCSS forward.

1.5.6 The ESO study took a fresh look at the drivers for network reinforcement in East Anglia, alongside the various considerations that need to be taken into account. This includes the requirement for us to develop proposals that represent value for money to consumers, while being in line with current planning policy, environmental legislation and our licence obligations.

[7] https://www.nationalgrideso.com/document/286066/download

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com

Norwich to Tilbury

Design Development Report:

Appendix C – Consideration of Pylon Options

April 2024

nationalgrid

Contents

1 Introduction

1.1 Purpose of this Appendix

1.1.1 The purpose of this Appendix is to describe the alternative generic pylon designs and how these alternatives have been considered, in response to feedback, for the Norwich to Tilbury Project (the Project).

1.1.2 For all projects mitigation is considered in accordance with potentially available mitigation - avoiding, minimising, restoring, and offsetting impacts. Mitigation for overhead line projects may include the following careful routeing, landscape mitigation planting, different traditional lattice pylon design / conductor configuration, alternative pylon design (low height or T-pylon), reduction of 'wirescape' through distribution network rationalisation /undergrounding, and alternative technology (undergrounding). These mitigations are not necessarily sequential but are considered as appropriate to specific local circumstances.

1.1.3 The explanation of how the design for the Project has evolved, including the pylon design, pylon locations and sections of underground cable is set out in the 2023 Design Development Report (which set out the 2023 preferred draft alignment) and the 2024 Design Development Report (to which this document is an Appendix).

1.1.4 Notwithstanding the above this Appendix provides a description of the key features associated with 'traditional' lattice and the T-pylon and considers the different characteristics and potential landscape and visual effects of the alternative pylon types. It also 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.

1.2 Context

1.2.1 Steel lattice pylons are common across the electricity system in the United Kingdom. 'Traditional' lattice have three sets of cross arms.

1.2.2 Alternative pylon types have been approved for use on the NGET network which may achieve the technical performance required for the Project. These two alternative types of pylon are low height lattice (which have two sets of cross arms and is wider) and the T-pylon, a monopole structure, lower in height than traditional lattice.

1.2.3 The T-pylon has now been constructed and is operational on the National Electricity Transmission System (NETS) as part of the Hinkley Connection.

1.2.4 National Grid has undertaken consultation on a number of its projects and the use of the T-pylons as an alternative to traditional steel lattice has been raised on many occasions.

Image 1.1: Typical suspension ‘traditional’ lattice pylon

Image 1.2 Typical suspension low height lattice

Image 1.3 Typical suspension T-pylon

2 Comparison of Alternative Pylon Types

2.1 Introduction

2.1.1 The choice of pylon design will be considered on a project-by-project basis. This section provides information on the features of 'traditional' lattice pylons, low height lattice and the T-pylon, including their construction, operation and maintenance.

2.1.2 Electrical lines that are on wooden poles operate at a much lower voltage than the National Electricity Transmission System (NETS) and as a result the gap between their cables and other conductive materials can be much smaller. At 400 kV, clearance between the wires and other conductive material needs to be greater than 3 m which is why the pylons operated by National Grid are taller than other electrical lines on the lower voltage distribution network. There is no wooden pylon design suitable for a 400 kV power line available in the UK. Wood poles have therefore not been considered further.

2.2 Design and Operational Characteristics

Design

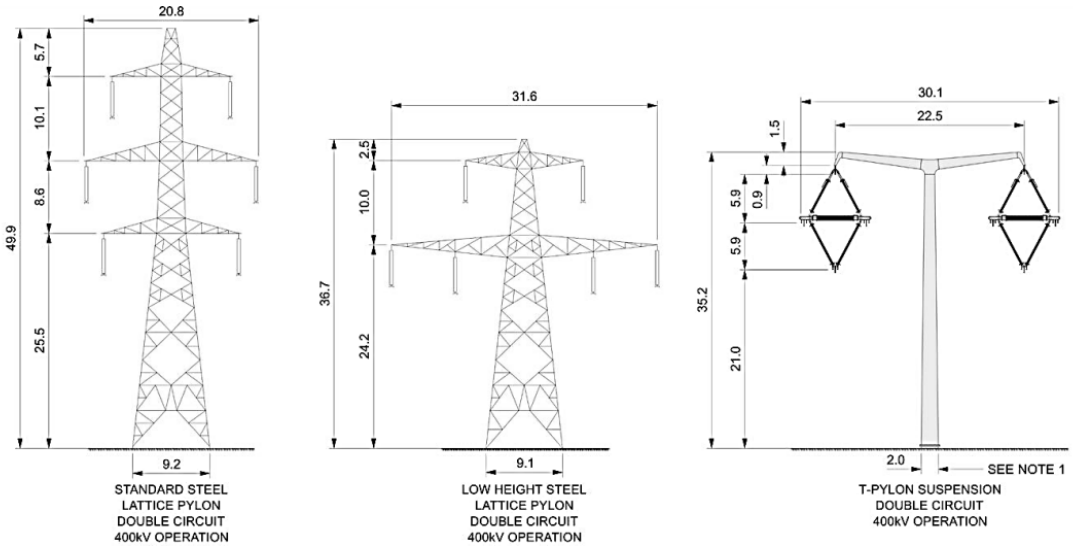
2.2.1 Whilst there are differences between lattice and T-pylon designs, they share a number of technical characteristics. These include:

- they are above ground structures capable of carrying high voltage conductors;
- they carry two circuits, one on each side of the structure;
- structures can be adapted for example to suit different terrains and physical obstacles such as river / road crossings; and
- they maintain statutory clearances.

2.2.2 For lattice pylons, each of the arms supports a conductor bundle and the top of the pylon supports an earth wire. For the T-pylon the conductors and earth wire are supported by the 'diamonds'.

2.2.3 Typical arrangements are shown in Figure 2.1

Figure 2.1 Alternative Pylon Types



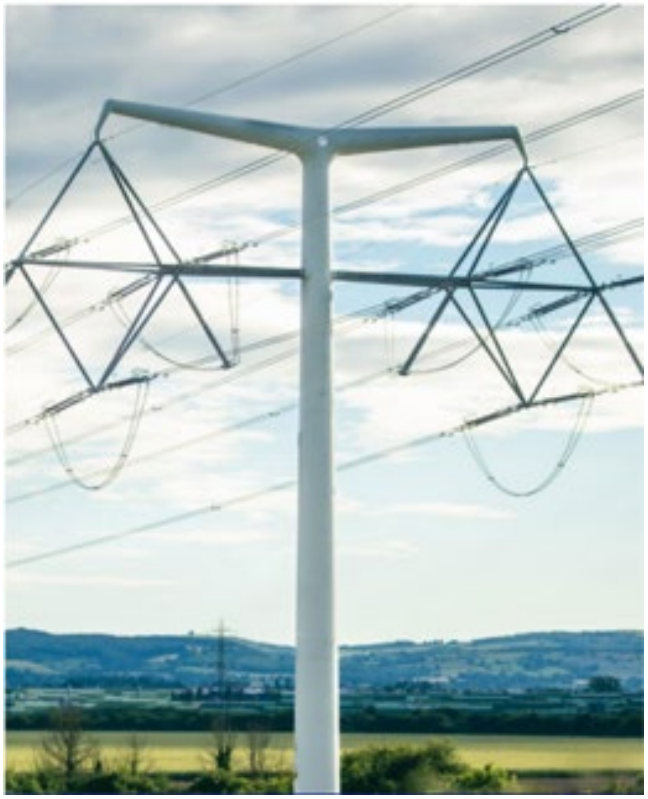
2.2.4 For traditional lattice, where an overhead line changes direction, and where lines terminate at substations or Cable Sealing End (CSE) compounds, stronger tension structures (tension pylon or gantries) are required. Tension pylons have heavier steelwork and larger footprints than the suspension pylons used where an overhead line runs in a straight line. Taller and heavier pylons with larger footprints are also required to negotiate more complex terrain.

Image 2.1 Typical suspension steel lattice pylon

2.2.5 Low height lattice are lower in height but wider than traditional lattice pylons and are generally used over relatively short straight sections of an overhead line route. Low height lattice may be incorporated into a design to mitigate specific circumstances, for example in the vicinity of airfields where additional clearance from an overhead line may be required.

2.2.6 The T-pylon offers a more simplistic structure with increased mass and a reduced permanent footprint. The conductors are arranged in a diamond configuration on both sides of the cross beam, with a separate earth wire each side of the pylon, above the conductors. As with the traditional lattice pylons, where an overhead line changes direction, and where lines terminate at substations or CSE compounds, stronger and heavier T-pylons (with an additional supporting member stabilising the diamond to the main structure, are required). T-pylons are shorter than traditional lattice.

Image 2.2 Typical tension T-pylon



2.2.7 Minimum statutory clearances must be maintained between conductors and the ground, trees, buildings and any other structures (such as electrified railways, motorways, overhead lines or similar crossings). The clearance required depends on factors such as the operating voltage of the line and terrain.

2.2.8 Lattice pylon heights can be adjusted by extension pieces, vertically in increments of 3 m as necessary to achieve statutory clearances (e.g. over major crossings). For the T-pylon height extensions are limited to 3 m for suspension pylons and 7 m for angle structures. As low height lattice and T-pylons are shorter than traditional lattice and T-pylons are limited in terms of extensions there may be particular locations where these designs cannot be used as statutory clearances may not be achieved.

2.2.9 Where an overhead line changes direction greater angles can be achieved by lattice pylons. For traditional lattice pylons a change in direction of up to 90 degrees can be achieved. For a T-pylon the maximum angle is 30 degrees therefore multiple T-pylon angle pylons would be required to achieve large changes of direction when compared to traditional lattice pylon overhead line routes.

2.2.10 For both traditional lattice, low height lattice and T-pylon the indicative span length is 330 m.

Construction

2.2.11 As construction methods for steel lattice pylons and T-pylons are similar, this section provides a comparison of the main differences in construction requirements.

2.2.12 In summary;

- although construction work areas for both the T-pylon and lattice pylons are similar in size, T-pylon work areas require a fully stoned and compacted level work area for delivery of the large tubular sections of pylon. Earthworks to level out sloping terrain will be required for all T-pylons;
- in general foundation installation is similar, utilising common piling or concreting techniques, however the T pylon requires a level, compressed surface to facilitate the specialist installation of the base flange which the pylon sits upon;
- both pylon types are erected by mobile crane however due to larger components a greater capacity crane is required for T-pylons;
- as T-pylons cannot be climbed, access for the installation of conductors and fittings is made from a Mobile Elevated Work Platform (MEWP). This requires a suitable access route to a level work area; both will be required to be left in situ for future maintenance and defect repairs; and
- conductors and fitting should be installed soon after the construction of T Pylons to reduce the impact of weather induced fatigue. A more critical, sequenced construction programme is therefore required. Lattice towers can be erected in advance of conductor installation with less risk of fatigue;

Operation and Maintenance

2.2.13 Overhead conductors have a life expectancy of approximately 40 – 60 years.

2.2.14 Maintenance operations include painting, corroded or damaged member replacement, insulator & fittings and conductor fittings replacement, pylon furniture repairs and other activities. Painting of the structures occurs approximately every 20 years and is based on a condition assessment. Painting of the crossarms and some sections of the pylon bodies requires the circuits to be switched out.

2.2.15 All lattice pylons on the network are climbable so many activities can be carried out without equipment such as MEWPS.

2.2.16 Bespoke and conventional maintenance and defect rectification procedures, manuals and methodologies for steel lattice pylons are widely available within National Grid. These procedures have been developed over many years and are compliant with National Grid's and UK safety requirements, covering not only structures but also insulators, conductor systems and other overhead line components.

2.2.17 For the T-pylon, challenges may be anticipated when carrying out maintenance, defect rectification or refurbishment works on these lines, including painting, insulator & conductor and fitting replacement. Maintenance works are especially intricate due to the complex nature of the insulator arrays installed. Due to access requirements repair times could be increased and may need longer outages.

2.2.18 Access using conventional methods such as climbing will not be possible and MEWPs will be required to access overhead line components for repair and/or replacement. A permanent access may therefore be required to be left in situ to each individual T-pylon site.

2.3 Landscape and Visual Observations

2.3.1 The following preliminary observations are made in relation to the potential landscape and visual effects of traditional lattice in comparison to the T-pylon design:

- at a height of around 35m, the T-pylon is anticipated to be visible over a smaller geographical area when compared with a traditional lattice pylon (c. 50m in height), due to the effects of intervening landform, vegetation and buildings. Given they are lower, screening by trees can more frequently be achieved;
- the T-pylon components have a bigger, wider and more solid mass than the slim components of a lattice pylon. Where views are more open T-pylons can be more highly visible for longer distances given their heavier structure. Lattice pylons are visually permeable and can disappear more readily when seen from a distance;
- T-pylons can in some situations appear more recessive than traditional lattice pylons when seen against the skyline, subject to colour, weather conditions and backlighting;
- when seen against a landscape backcloth (e.g. a wooded ridgeline), T-pylons can be more visible over longer distances in comparison to traditional lattice pylons, as the structures are of heavier, more solid mass, although it is noted that colour selection could help to reduce visibility in some settings;
- the wirescape associated with T-pylons is concentrated in a more compact area than is the case with lattice pylons. T-pylon angle structures are more complex than suspension T-pylons, and the wirescape in particular can create visual confusion, particularly in close views. Given the limit of a 30 degree angle change for T-pylons, it is likely that more angle pylons would be required when compared with traditional lattice pylons, which could be seen to worsen visual effects;
- in all landscape contexts, careful consideration will need to be given to the relationship leading to cumulative effects between T-pylons and existing infrastructure, including traditional lattice pylons and wind turbines. Multiple types of vertical infrastructure could be seen to present a confusing visual image and result in cumulative landscape and visual effects;
- T-pylons may be considered more appropriate in an urban edge context where their modern design may complement other modern structures, particularly in relation to industrial areas and modern development;
- T-pylons may require permanent access at more frequent intervals than a traditional lattice overhead line, with associated landscape and visual effects as a result of new tracks. They also require greater excavation for the larger concrete foundations and so can result in landscape and visual effects as a result of excavation works, which may need to be permanent; and
- the lowest wires of a T-pylon are wider, when compared with a traditional lattice pylon, this could result in additional vegetation removal where an overhead line is proposed to pass through woodland, with consequent effects.

3 Consideration of Alternative Pylons for The Project

3.1 Introduction

3.1.1 This section sets out a high-level overview of traditional lattice and T-pylon for the Norwich to Tilbury Project (the Project).

3.1.2 The Design Development Report 2023, published for the non-statutory consultation, described the 2023 preferred draft alignment and described how the design of the Project (pylon locations and underground cable sections) had evolved.

3.1.3 Following feedback to the 2023 non-statutory consultation and further assessments the 2024 preferred draft alignment has been developed and is the subject of the statutory consultation.

3.1.4 At the current time the design does not include low height pylons as no locations have been identified where this pylon type would provide necessary mitigation. Low height pylons have therefore not been considered further in this review.

3.2 Landscape and Visual Considerations

3.2.1 As there is the potential for significant landscape and visual effects to be experienced, an initial appraisal was undertaken to identify locations which may be suitable for T-pylons, based on the observations set out in Section 2.3. A technical review was also undertaken, and a judgement reached as to potential locations, where the T-pylons may provide mitigation to a traditional lattice pylon.

3.2.2 Locations are described from north to south.

South Norfolk District

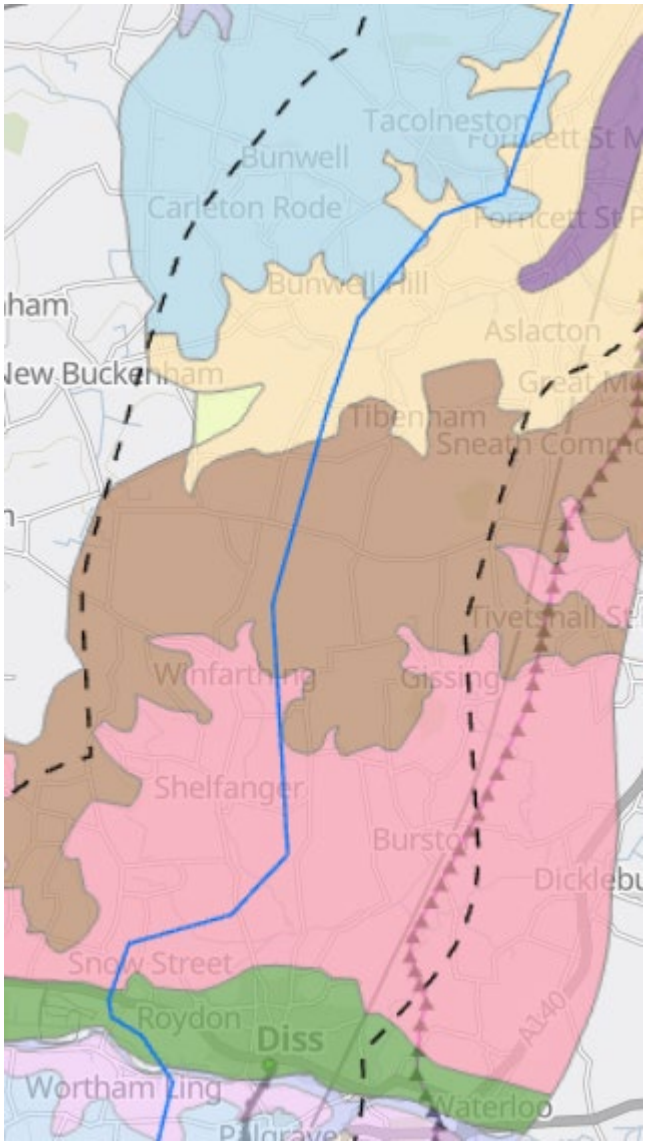
3.2.3 Within South Norfolk District the Project will run between the existing substation (Norwich Main) at Norwich and Diss, on the boundary with Mid Suffolk. The Project will pass through the following landscape character types: Tributary Farmland; Settled Plateau Farmland; Plateau Farmland; and Rural River Valley. These landscape character types are typically flat to gently undulating and large in scale. The farmland Landscape Character Areas (LCAs) have characteristics which may be suitable for accommodating T-pylons, being large in scale and typically with large and regular field patterns. The Waveney Rural River Valley LCA in the south marks the boundary between Norfolk and Suffolk and is characterised by its flat, wide floodplain and gently sloping valley sides.

3.2.4 In the north (east of Mulbarton) T-pylons have the potential to create cumulative conflicts with the existing 400 kV line which runs in parallel. In the south (north and west of Diss), the Project will change direction several times. The requirement for angle pylons along a T-pylon alignment in proximity to sensitive residential receptors will not help to mitigate visual effects.

3.2.5 For the remaining sections of the Project in South Norfolk the 2023 preferred draft alignment follows a relatively straight path and would therefore require fewer prominent angle pylons. There are also few existing overhead lines in this area, reducing the potential for cumulative conflicts between different types of infrastructure. The use of T-pylons has been further explored in the area approximately between Tacolneston and Shelfanger (see Figure 3.1).

3.2.6 Note: All figures in Section 3 show the 2023 preferred draft alignment (blue line), a 3 km study area buffer and landscape character area. The 3 km study area buffer reflects that which is proposed for the Landscape and Visual Impact Assessment. The study area has been informed by the type and scale of the Project including the overhead line proposed (steel lattice pylon at a standard height of typically 50 m) and the nature of the receiving landscape. Existing overhead lines are shown in pink (400 kV) and brown (132 kV).

Figure 3.1 South Norfolk District



Mid Suffolk District

3.2.7 Within Mid Suffolk District the Project will run between the Waveney Valley and the existing substation at Bramford. The Project will pass through the following landscape character types: Rolling Valley Farmlands and Furze; Ancient Plateau Claylands; Plateau Claylands; Rolling Valley Claylands; Valley Meadowlands; and Rolling Valley Farmlands. The plateau character types are typically flat or gently undulating, and the valleys typically have flat bottoms with gently sloping valley sides. In general terms, given their subtle topography these LCAs may be able to accommodate T-pylons but detailed consideration would need to be given to specific locations.

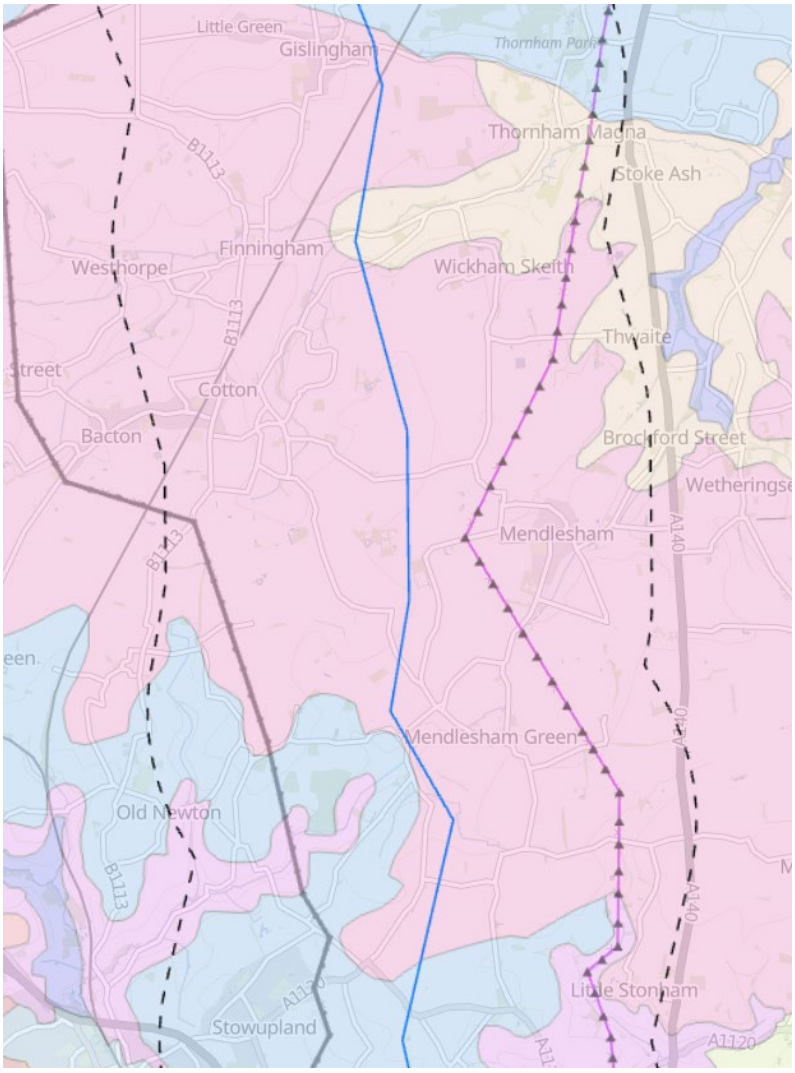
3.2.8 Within Mid Suffolk there may be some cumulative conflicts between T-pylons and existing overhead lines, including:

- where the Project would cross existing 132 kV lines near Mellis in the north and Barking in the south;
- where the Project would run close to an existing 400 kV overhead line near Mendlesham;
- where the Project would run between existing 400 kV and 132 kV lines south of Mendlesham towards Needham Market; and
- where the Project would run in parallel to an existing 132k between Barking and the substation at Bramford.

3.2.9 Multiple lines would be seen converging at Bramford substation, where the addition of T-pylons could be seen to create visual confusion. There will also be a number of changes in direction along the 2023 preferred draft alignment which for the T-pylon would likely require more angle pylons in proximity to sensitive residential receptors, including where the Project will pass around Needham Market, Barking, Offton and Flowton in the south.

3.2.10 T-pylons could potentially be accommodated in the relatively straight run between Gislingham and Stowupland. Due to the routeing fewer angle pylons would be required and there would be fewer cumulative conflicts (see Figure 3.2).

Figure 3.2 Mid Suffolk District



Babergh District

3.2.11 Within Babergh District the Project will run between Bramford Substation (in Mid Suffolk) and the Dedham Vale Natural Landscape (an Area of Outstanding Natural Beauty (AONB)). The overhead line will pass through the following landscape character types: Ancient Plateau Claylands; Rolling Valley Farmland; Ancient Estate Claylands; and Plateau Farmland. These character types may be suitable for accommodating T-pylons, being large in scale and with regular field patterns. However, the north of Babergh District around Burstall is unlikely to be suitable for T-pylons because of potential cumulative conflicts with other infrastructure entering Bramford Substation, and the crossing of the valley of the Belstead Brook. The south of Babergh District forms part of the setting of Dedham Vale Natural Landscape (an AONB) and is unlikely to be suitable for T-pylons due to potential intervisibility from its elevated northern enclosing ridgeline.

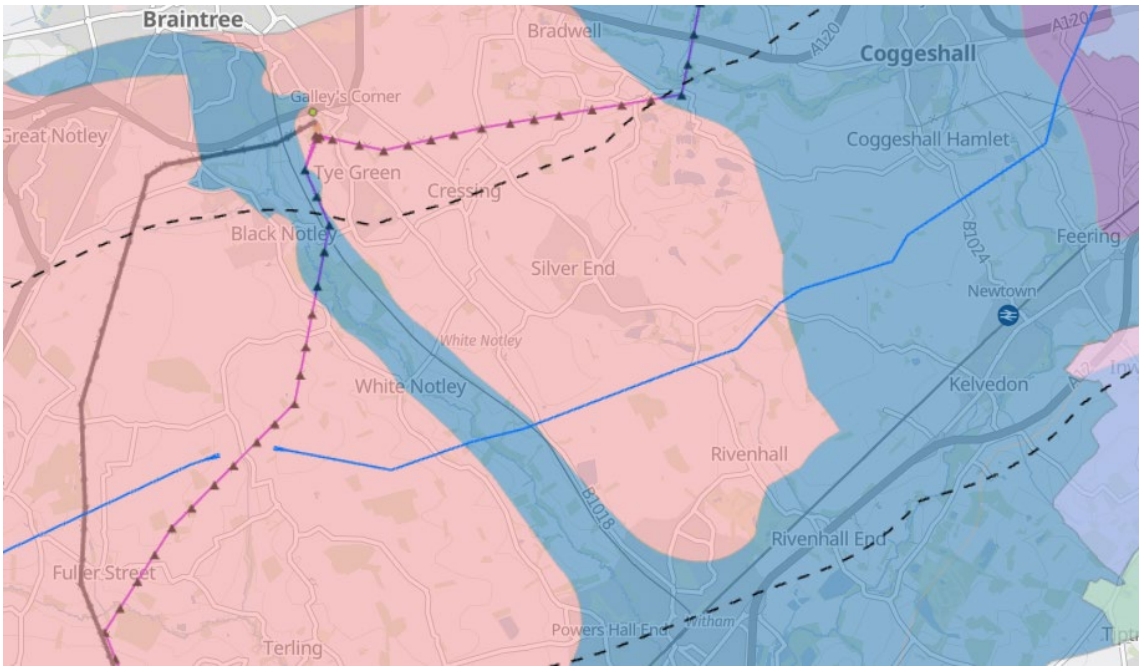
Tendring District / Colchester District

3.2.12 Between the proposed East Anglia Connection Node (EACN) substation in the east and the vicinity of Fordham in the west, the Project will run to the south of the Dedham Vale Natural Landscape (an AONB), within the area which forms the wider setting to the AONB. It will pass through the following LCAs: Bromley Heath (an exposed and windswept plateau landscape with large scale arable fields); Great Horkesley Farmland Plateau (farmland plateau with small to medium-scale fields) and Rochfords Farmland Plateau (medium to large-scale fields, more open and exposed than the Great Horkesley Farmland Plateau). These LCAs have characteristics which may be suitable for accommodating T-pylons, being large in scale and with regular field patterns. However, potential intervisibility with the Dedham Vale Natural Landscape (from its elevated southern enclosing ridgeline) and proximity to sensitive residential receptors will make this area less suitable for T-pylons. The Project will pass through several pinch points (including north of Ardleigh), and the 2023 preferred draft alignment will necessitate multiple changes in direction, requiring the use of more prominent angle pylons in proximity to sensitive visual receptors. Between Fordham and the Colchester District boundary near Surrex, the Project will cross the Colne Valley (Colne River Valley Floor and Colne River Valley Slopes LCAs), where the T-pylons may be seen to conflict with the relatively steep, V-shaped valley and its small linear settlements. South of the Colne Valley (Easthorpe Farmland Plateau LCA) the Project will take several changes in direction, requiring more prominent angle pylons in proximity to residential receptors, making this section less suitable for T-pylons. Although some challenges have been identified with T-pylon use in this area, it has been taken forward to the technical review stage (see Table 3.1) because the Project is in proximity to the Dedham Vale Natural Landscape (an AONB) and sensitive residential receptors and warrants further investigation in terms of options for mitigation.

Braintree District

3.2.13 Within Braintree District the Project will pass through the Gosfield Wooded Farmland LCA (a wooded and enclosed, flat to gently undulating landscape), Black Water and Brain Valley LCA (shallow farmed valleys, with gently undulating valley sides) and Central Essex Farmland LCA (an extensive LCA with gently undulating topography). The subtle topography and wooded nature of these LCAs may make them more suited to T-pylons, with vegetation helping to screen the pylons in more distant views. The 2023 preferred draft alignment also follows a relatively straight path in this section and would therefore require fewer prominent angle pylons. There are few existing overhead lines in this area, reducing the potential for cumulative conflicts between different types of infrastructure. The use of T-pylons was further explored in the area illustrated on Figure 3.3, between Fuller Street and Coggeshall.

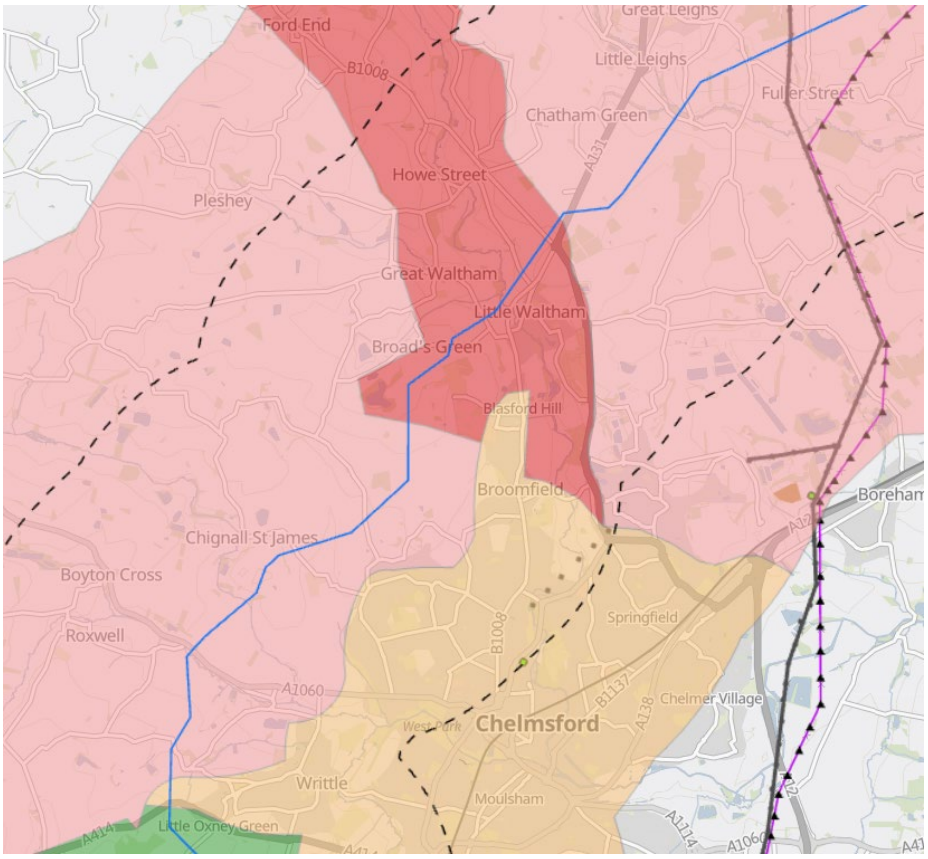
Figure 3.3 Braintree District



Chelmsford City

3.2.14 Within Chelmsford the Project will pass through the extensive Central Essex Farmland LCA, which is dissected by the narrow Chelmer Valley LCA between Little and Great Waltham. The topography is gently undulating, crossing several small valleys which dissect the farmland. The topography becomes more pronounced in the south at Coptfold near the boundary with Brentford. The 2023 preferred draft alignment is relatively straight in the north. In the south there are several changes in direction where the 2023 preferred draft alignment passes to the east of Edney Common. There are few existing overhead lines in this area, reducing the potential for cumulative conflicts between different types of infrastructure. Parts of the overhead line are in proximity to the urban edge of Chelmsford, where the modern appearance of the T-pylons may complement other modern buildings and land uses. The use of T-pylons was further explored in the north of Chelmsford District, as illustrated on Figure 3.4, at Chelmsford North. Careful consideration would need to be given to effects at the pinch point between Great and Little Waltham in the Chelmer Valley

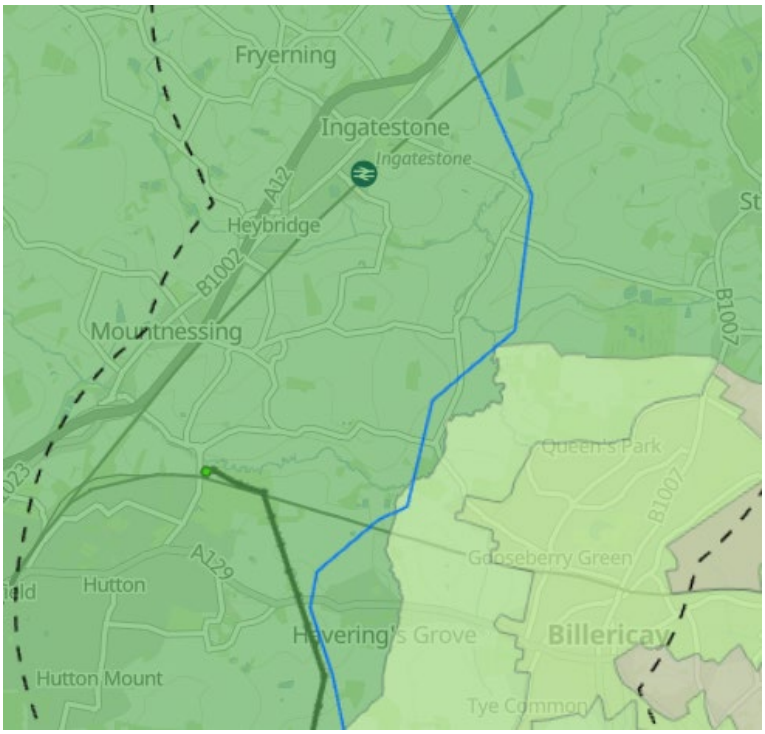
Figure 3.4 Chelmsford City



Brentwood District / Basildon District

3.2.15 Between the Brentwood local authority boundary near Ingatestone and Havering's Grove, on the boundary with Basildon, the Project will pass through the Brentwood Hills LCA. The Brentwood Hills LCA is characterised by gently to strongly undulating hills and ridges, with dense vegetation creating a sense of enclosure. In this northern part of Brentwood the landscape is gently undulating. T-pylons could help to mitigate landscape and visual effects as their lower height coupled with existing layers of vegetation would make them less visible to sensitive visual receptors including residents at Ingatestone. There are few existing overhead lines in this area, reducing the potential for cumulative conflicts between different types of infrastructure. The use of T-pylons was further explored in the area illustrated on Figure 3.5, between Brentwood and Ingatestone.

Figure 3.5 Brentwood District / Basildon District

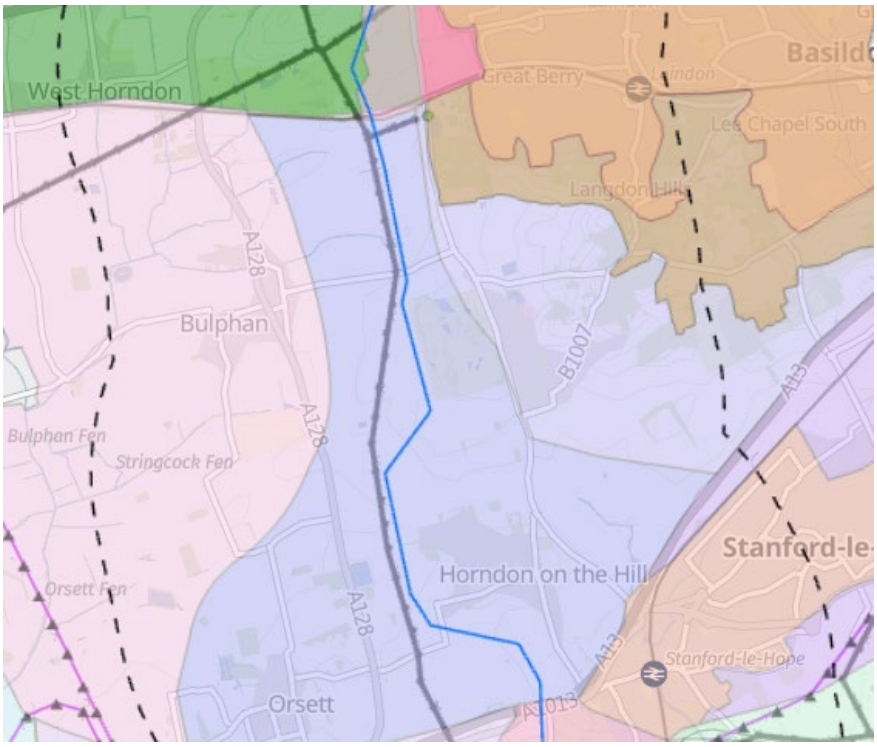


3.2.16 At Havering's Grove the Project will pass through a narrow pinch point before crossing higher ground along the boundary between Brentwood and Basildon. It will pass through the Wooded Farmland, Sloping Farmland and Lowland Settled Claylands character types. South of the A127 the Project will cross an existing 132 kV line in two locations. This southern section is less suitable to T-pylons as the terrain is more strongly undulating, and there could be visual conflicts with the infrastructure where it will cross the existing 132 kV overhead line.

Thurrock District

3.2.17 Between the local authority boundary and Southfields, the Project will pass through the Sticking Hill Rolling Farmland / Wooded Hills LCA, an area of gently undulating terrain. Between the local authority boundary and the historic settlements of Orsett and Horndon on the Hill, the 2023 preferred draft alignment is straight, and runs parallel to an existing 132 kV overhead line. In this section T-pylons could help to mitigate landscape and visual effects as they would mainly be seen on the skyline (although may be backclothed by layers of vegetation in some views), and their lower height would make them less visible from the settlements of Bulphan, Orsett and Horndon on the Hill. There may be some visual conflicts with the 132 kV steel lattice overhead line which runs in parallel. The use of T-pylons has been explored further in the area illustrated on Figure F, between Bulphan and Horndon on the Hill.

Figure 3.6 Thurrock



3.2.18 Between Horndon on the Hill and the substation at Tilbury Marshes the Project will pass to the east of Southfields, as well as the settlements of Linford, East Tilbury, West Tilbury, Chadwell St Mary and Tilbury. In this section it will cross several urban fringe character areas before entering Tilbury Marshes at the substation via underground cable. These character areas combine farmland with urban and industrial land uses, and there are multiple overhead lines resulting in visual intrusion. In this section the Project would need to change direction several times at it will pass between settled areas. T-pylons could be seen to create visual confusion as they would be seen in combination with multiple other overhead lines on lattice pylons. It is likely that multiple angle pylons would be required, and that these would be seen in close views from settled areas. This section is therefore unlikely to be suitable for T-pylons.

3.3 Technical Review

3.3.1 The sections identified by the landscape and visual team as potentially being appropriate for T-pylons were then assessed by the overhead line engineering team. The assessment was based on the 2023 preferred draft alignment (which proposed traditional lattice pylons). The assessment method included;

- pylon height review (i.e. suitability to replace the lattice pylon with a T-pylon, subject to the constraint on limited vertical height increments for the T-pylon); and
- alignment review (i.e. substituting lattice pylon angles of greater than 30 degrees with multiple T-pylon angle structures, adding in additional T-pylon structures, or retaining the need for lattice pylons greater than 30 degrees if the change of alignment is constrained.

3.3.2 In general to replace the lattice pylon alignment with a T-pylon alignment would require additional angle pylons to navigate constraints and changes in direction. Simultaneously the restriction on T-pylon height would require the use of some traditional lattice pylons to achieve statutory clearances such as major crossings (see Table 3.1).

Table 3.1: Summary of indicative technical solutions and technical constraints

Location	Indicative Technical Solution						Summary of Technical Constraints
	Lattice			T-pylon			
	Suspension (no)	Angle (no)	Avg. Height (m)	Suspension (no)	Angle (no)	Avg. Height (m)	
Tacolneston to Shelfanger (South Norfolk)	35	7	51.9	30	12	36.9	This section would require a minor change to the 2023 preferred draft alignment which would bring the overhead line closer to some properties near Tacolneston. The average height of the T-pylons would be approximately 15m lower than traditional lattice pylons.
Diss (South Norfolk / Mid Suffolk)	16	9	50.5	13	12	36.2	T-pylons would require a change to the 2023 preferred draft alignment which would bring the overhead line closer to some properties and a designated moat. Additional angle structures would be required for T-pylons. The average height of the T-pylons would be approximately 14m lower than traditional lattice pylons.
Gislingham to Stowupland (Mid Suffolk)	32	10	52.4	29	13 (11+2 Lattice)	38.1	This section would require a rail crossing that cannot be cleared with a T-pylon design and would therefore require a transition to lattice pylons at RG118 and RG119. It would be possible to have T-pylons between RG120 and RG156, although a minor change would be required to the 2023 preferred draft alignment. This would bring pylons closer to properties at Saxham Street, near Middlewood Green. There would be a small increase in the number of angle pylons required. The average height of the T-pylons would be approximately 14m lower than lattice pylons.
EACN substation to Great Horkesley (Babergh, Tendring and Colchester)	18	13	51.6	9	23 (17+6 Lattice)	39.8	This location would require multiple critical crossings that cannot be cleared with T-pylons and would therefore require several changes between lattice and T-pylon. Substantial alignment changes would

Location	Indicative Technical Solution						Summary of Technical Constraints
	Lattice			T-pylon			
	Suspension (no)	Angle (no)	Avg. Height (m)	Suspension (no)	Angle (no)	Avg. Height (m)	
							require more angle structures for T-pylons, many of which would be in proximity to properties.
Fuller Street to Coggeshall (Braintree)	38	19	52	34	23 (18+5 Lattice)	38.4	This section would require multiple critical crossings and long spans that cannot be cleared with T-pylons and would therefore require a transition to lattice pylon at TB76-78, TB100 and TB199. There is also a planned cable section north of Fairstead to cross the existing 400 kV overhead line. A change to the alignment would be required at TB84 to TB91, which would bring the line closer to properties at Felix Hall (although there is existing vegetation around the properties which would filter and screen views). Chelmsford Bypass at TB129-130 may require an increased clearance that is unachievable with T-pylons, although this is unknown at this time. There would be a small increase in the number of angle pylons required. The average height of the T-pylons would be approximately 14 m lower than lattice pylons.
Chelmsford North (Chelmsford)	14	8	51.1	7	15 (13+1 Lattice)	37.6	This section would require substantial changes to the 2023 preferred draft alignment, which would bring the line closer to properties and woodland. TB141 would oversail a property. There would also be a highly constrained areas between Little Waltham and Partridge Green.
Brentwood to Ingatestone (Brentwood / Basildon)	17	9	53	12 (9+3 Lattice)	15 (9+6 Lattice)	43.2	This section would require multiple critical crossings and angle changes that cannot be cleared with a T-pylon and would therefore require a transition to lattice pylon at TB183-186 and TB200-204 as well an extra pylon. Substantial changes to the 2023 preferred draft alignment would be required, which would bring the line closer to properties.

Location	Indicative Technical Solution						Summary of Technical Constraints
	Lattice			T-pylon			
	Suspension (no)	Angle (no)	Avg. Height (m)	Suspension (no)	Angle (no)	Avg. Height (m)	
Bulphan to Horndon on the Hill (Thurrock)	16	17	50.4	11	22 (18+4 Lattice)	38.1	This section would require rail and landfill crossings with clearances which are unachievable with T-pylons. Therefore, changes between lattice and T-pylon would be required at two crossing points (TB225-226 and TB253-254). T-pylons would also require several changes to the draft preferred alignment, resulting in reduced clearances to properties and other infrastructure (mainly gas pipelines). There would be a small increase in the number of angle pylons required. The average height of the T-pylons would be approximately 12 m lower than lattice pylons.

4 Consideration of T-pylon as Mitigation

4.1.1 Following the high-level landscape and visual, and engineering reviews the areas listed below were taken forward for further consideration;

- Tacolneston to Shelfanger (South Norfolk);
- Diss (South Norfolk / Mid Suffolk);
- Gislingham to Stowupland (Mid Suffolk);
- Fuller Street to Coggeshall (Braintree); and
- Bulphan to Horndon on the Hill (Thurrock).

4.1.2 These areas were considered to have the potential for T-pylons to mitigate landscape and visual effects and were also considered technically feasible without the need for multiple transitions from T-pylon to lattice and back again (see Table 4.1).

4.1.3 For the locations, EACN substation to Great Horkesley, Chelmsford North, and Brentwood to Ingatestone the technical constraints, combined with the potential for greater landscape and visual effects, meant that those areas were not examined in further detail.

Table 1.1: Summary of advantages and disadvantages of T-pylons, and conclusions

Location	Advantages of T-pylon	Disadvantages of T-pylon	Conclusions
Tacolneston to Shelfanger (South Norfolk)	Average height would be reduced by approximately 15m, helping to reduce visibility. Relatively straight alignment - so fewer additional angle pylons would be required. Cumulative conflicts with existing infrastructure would be limited.	Change in the 2023 preferred draft alignment would be required – routeing closer to properties.	T-pylons could be accommodated in the landscape between RG35 [1]and RG75 although it is unlikely that effects would reduce to a level which would no longer be considered to be significant. The reduction in height would be beneficial in helping to screen and filter views of the T-pylons, particularly in more distant views where there are layers of vegetation between the viewer and the Project. The reduced height would also reduce the scale contrast with existing landscape elements, as illustrated in Figure 2.1. The transition from lattice to T-pylon at either end of the section would need careful consideration, to avoid cumulative effects resulting from varied types of infrastructure. Although this location would be suitable for T-pylons, it is unlikely that there would be a reduction in

[1] Pylon numbers in Table 4.1 refer to the 2023 preferred draft alignment.

Location	Advantages of T-pylon	Disadvantages of T-pylon	Conclusions
			the significance of effect at most viewpoints.
Diss (South Norfolk / Mid Suffolk)	Average height would be reduced by approximately 14m, helping to reduce visibility	Multiple changes in direction would require more angle pylons. Change in the 2023 preferred draft alignment would be required – routeing closer to properties and a scheduled moat	T-pylons would not mitigate landscape and visual effects in this location. Overall the benefits of the reduction in height which may be experienced by some groups of visual receptors would be offset by the change in the 2023 preferred draft alignment and proximity of more visually intrusive angle pylons to sensitive receptors including local residents in Roydon.
Gislingham to Stowupland (Mid Suffolk)	Average height would be reduced by approximately 14m, helping to reduce visibility. Relatively straight alignment - so fewer additional angle pylons required. Cumulative conflicts with existing infrastructure would be limited, apart from localised areas west of Mendlesham and east of Stowupland	Would require transition to lattice in the north (RG118-119) to cross the railway. Small increase in number of angle pylons required, some in proximity to residential properties. Change in the 2023 preferred draft alignment would b required – closer to properties at Saxham Street, west of Middlewood Green	T-pylons could be accommodated in the landscape between RG120 and RG156 although it is unlikely that effects would reduce to a level which would no longer be considered to be significant. The reduction in height would be beneficial in helping to screen and filter views of the T-pylons, particularly in more distant views where there are layers of vegetation between the viewer and the Project. The reduced height would also reduce the scale contrast with existing landscape elements. The transition from lattice to T-pylon at either end of the section would need careful consideration, to avoid cumulative effects resulting from varied types of infrastructure. Although this location would be suitable for T-pylons, it is unlikely that there would be a reduction in the significance of effect at most viewpoints.
Fuller Street to Coggeshall (Braintree)	Average height reduced by approximately 14m, helping to reduce visibility. Relatively straight alignment - so fewer additional angle pylons required. Cumulative conflicts with existing infrastructure limited,	Would require transition to lattice in three locations (TB76-78, TB100 and TB199) Change in the 2023 preferred draft alignment would be required – closer to properties at Felix Hall	T-pylons would not mitigate landscape and visual effects in this location. The benefits of the reduction in height would be offset by potential cumulative interactions with the existing 400 kV lattice pylons north of Fairstead and at other locations where a transition to lattice pylons would be required to accommodate clearances and spans. The resulting cumulative

Location	Advantages of T-pylon	Disadvantages of T-pylon	Conclusions
	apart from localised areas north of Fairstead, where the Project crosses an existing 400 kV overhead line		effects would be experienced by sensitive receptors including local residents at Fairstead and Feering.
Bulphan to Horndon on the Hill (Thurrock)	Average height would be reduced by approximately 12 m, helping to reduce visibility including from larger settlements. Relatively straight alignment so fewer additional angle pylons required.	Would require transition to lattice in two locations (TB225-226 and TB253-254). Change in the 2023 preferred draft alignment would be required – closer to some properties. Potential cumulative conflicts with existing lattice 132 kV line which runs in parallel, although scale would be more comparable than lattice.	T-pylons would not mitigate landscape and visual effects in this location. The benefits of the reduction in height would be offset by potential cumulative interactions with the existing lattice 132 kV line which runs in parallel and at other locations where a transition to lattice pylons would be required. The two designs (lattice and T-pylon) could be seen to conflict, although it is noted that the scale difference would be reduced. The resulting cumulative effects would be experienced by sensitive receptors including local residents at Horndon on the Hill.

5 Summary and Conclusions

5.1.1 Eight areas were considered appropriate for further technical review. That review concluded that T-pylons would not be feasible in three sections, due to a combination of technical reasons including span length, road/rail/infrastructure crossings (requiring a mix of T-pylons and lattice pylons) and changes in direction. These three sections were EACN substation to Great Horkesley; Chelmsford North; and Brentwood to Ingatestone.

5.1.2 The remaining five areas (Tacolneston to Shelfanger, Diss, Gislingham to Stowupland, Fuller Street to Coggeshall, and Bulphan to Horden on the Hill) were reviewed further to identify any potential advantages and disadvantages of T-pylons in terms of landscape and visual effects. It was concluded that, in some areas, T-pylons could be accommodated within the landscape and would have some benefits over traditional lattice pylons, including a reduction in height which would reduce the contrast in scale experienced by traditional lattice pylons with other elements in the landscape including buildings and trees. Although in certain locations the lower height of the T-pylon may benefit receptors in more distant views where layers of vegetation including field boundary hedgerows and woodland would filter and screen views of the Project, they may also have their own negative effects due to the more intrusive angle towers and the transitions between overhead line technologies.

5.1.3 Although the T-pylons may offer the opportunity to mitigate potential landscape and visual effects when compare with other technologies it is not likely that, for the Project, the overall net benefits of T-pylon (when considering their own disadvantages) would produce an overall favourable alternative to traditional lattice pylons considering all factors that National Grid is required to take into account under its statutory duties.

5.1.4 The design for the statutory consultation, the 2024 preferred draft alignment, includes traditional lattice pylons. Additional sections of undergrounding have been added to the design since the 2023 non statutory consultation to mitigate effects. National Grid will continue to backcheck the outcome of its appraisals in response to feedback to the statutory consultation and further studies.

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com